

# Effect of Mindful Meditation, Physical Activity, and Diet to Reduce the Risk to Develop or Reduce Severity of Cardiovascular Diseases in Saudi Arabia: A Systematic Review

Arwa Al-Saber<sup>1,2</sup>, Al-Nabaheen May<sup>1,2</sup>

<sup>1</sup>Health Science College of the Saudi Electronic University (SEU), Dammam, Saudi Arabia

<sup>2</sup>Colorado State University (CSU), Fort Collins, USA

Email: arwamansour@gmail.com

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## Abstract

**Background:** Cardiovascular Disease (CVD) is one of the leading chronic diseases in Saudi Arabia (SA) that cause disability and death. CVD predisposition risk varies according to age, gender, education, socioeconomic factors, and place of residency. In addition, CVD risk factors include physical inactivity, sedentary lifestyle, saturated fatty acid high diet, smoking, and stress. **Aim:** This is a systematic review study that aims to determine the effect of mindful meditation, physical activity, and diet on CVD in SA. **Materials and Methods:** This is a systematic electronic search method in Google scholar, PubMed, and Medline. Papers collected are papers that have been published since 2015. The search uses the following keywords: (Cardiovascular disease OR physical activity OR Physical inactivity OR meditation OR diet) AND Saudi Arabia. Data were extracted from each study through a narrative summary of each study. **Results:** Forty papers collected from 2015 to 2022 were included in the narrative study. Physical activity, diet, and mindful meditation are among the factors that can reduce the risk of development of CVD or severity of disease in patients with a CVD. **Conclusion:** This systematic review emphasized risk factors like physical inactivity, poor diet, and low level of awareness among Saudis and CVD Saudi patients. The findings show the role of physical activity, mindful meditation, and diet in reducing the onset or severity of cardiovascular disease.

## Keywords

Cardiovascular Diseases, Risk Factors, Physical Activity, Diet, Mindful Meditation, Saudi Arabia

## 1. Introduction

Cardiovascular Disease (CVD) is the primary cause of disability and death worldwide. CVDs include Myocardial Infarction (MI) [1], Coronary Artery Disease (CAD) [2], coronary heart disease (CHD), cerebrovascular disease, peripheral arterial disease, rheumatic heart disease, congenital heart disease, deep vein thrombosis, and pulmonary embolism [3].

CVD is responsible for 45% of total mortality rates in Gulf Council Countries (GCC) [4]. Various researches done around the globe include INTERSTROKE, INTERHEART, Gulf Registry of acute coronary events (Gulf RACE), and African Middle East Cardiovascular Epidemiological (ACE) study summarizing mutual risk to CVD [4]. Of the risk factors identified where dyslipidemia, obesity, physical inactivity, and unhealthy diet [4], 94% of the risk factors are modifiable risk factors that can be prevented [4], of which diet and physical inactivity have a major role [4]. A study showed that people who sit for more than 10 hours have 38% higher risk to develop MI and 31% risk of death compared to people who sit for less than 6 hours per day [4].

### 1.1. Background and Significance of the Study

The population of Saudi Arabia (SA) is changing rapidly, geographically, and economically [5]. Many people are shifting from rural to urban areas with improved economic and more sedentary lifestyles, spending a lot of time on TV and electronic devices besides eating processed food [6]. The lifestyle in urban areas increases the prevalence of obesity, cholesterol level, and high blood pressure, and is accompanied by rising CVD incidence [7].

Epidemiological studies are essential to develop a clear idea about the risk factors of CVDs and implement interventions to manipulate them [5]. Many risk factors can be traced and monitored by epidemiological studies to establish methods to reduce the risk of disease onset and progression [5] [7]. Developed countries have participated in many epidemiological studies, but these studies rarely occur in developing countries [5], particularly in SA [8].

### 1.2. Statement of the Problem

Physical inactivity is the primary cause of non-communicable diseases [9] [10] and is the fourth cause of death worldwide, as described by the World Health Organization (WHO) [9]. Physical inactivity causes 6% of CVDs, and increasing one's PA can reduce the risk of up to 35% of CVDs by increasing cardiorespiratory and muscular strength [9]. In SA, more than half of the population is inactive, and 90% of the population spends more than two hours continuously sitting [9]. Physical inactivity is a significant risk factor for CVD and is closely related to age, weight, level of education, and place of residence [7]. Physical activity (PA) is the movement of a skeletomuscular system that produces a considerable increase in energy over a resting state [6] [9] [11] [12]. PA was not always a protective agent for developing CVD in some age groups, which indicates that

other factors like anxiety, gender, and the surrounding environment can be [6]. Moreover, the type and intensity of a PA that protects against CVD should be determined [6]. The relationship between physical activity and age or physical activity and educational level is inversely proportional [7]. Only a few studies published in SA about the relationship between PA and CVD to validate the evidence of the relationship between them [6].

National Transformational Program (NTP) 2030 is promoting PA and applying measures to introduce its vision of being a vibrant society through supporting physical and psychosocial well-being [13]. An example of psychosocial intervention is the Mindful Jeddah Training Program (MJTP) was driven by the Mindful Based Stress Reduction (MBSR) program [13] [14] developed by Kabat-Zinn in 1990, and Mindfulness-Based Cognitive Therapy (MBCT) developed by Segal, Williams, and Teasdale (2002) [14]. Mindfulness is one's ability to focus their attention on the current moment [14]. Mindfulness-based interventions (MBIs) have increasingly gained attention in recent decades [14]. MBI is a meditation program to reduce stress and anxiety [14] [15]. Mindful-based therapy programs have significant impact on physical and mental health [13]. Mindful meditation increases awareness and enhances the ability to deal with diseases like CVD, high blood pressure, and chronic pain [13]. Therefore, professionals believe it is essential to introduce meditation, including religious practices, as a psychological intervention for various chronic diseases [13].

Diet is a vital adjustable risk factor for CVD [16]. Food combination and dietary patterns directly prevent or increase the risk of CVD [16]. Dietary guidelines intend to provide evidence-based guidance to reduce Non-communicable diseases (NCD) [16]. Ministry of Health (MOH) issued a food guide to offer food selections, combinations, and quantity of daily intake that reduce the risk of chronic diseases like CVDs and have an antagonist effect on excellent health [16]. Studies and data collected are limited in Saudi compared to developed countries [16].

Dietary supplements can add nutritional value to everyday regimens [17]. Dietary supplements like multivitamins, Vitamin D, and C are primarily used [17]. Unfortunately, people rarely consult a healthcare professional before using food supplements [17]. Lack of balanced and healthy diet [18], in addition to improper and clinically approved dietary supplements [17], increases the risk of NCD [18].

### 1.3. Research Questions

- 1) What is the effect of PA in reducing the risk of developing CVDs and reducing the severity of patients with CVDs in SA.
- 2) What is the effect of mindful meditation in reducing the risk of developing CVDs and reducing the severity of patients with CVDs in SA.
- 3) What is the effect of diet in reducing the risk of developing CVDs and reducing the severity of patients with CVDs in SA?

## 2. Literature Review

NCDs are the cause of 70% of deaths worldwide [2]. NCD like CVD is a primary

public concern and is responsible for almost half of the mortality rate in SA [8]. Male gender is more than one-third higher than female in developing a CVD [8]. CVDs are the main cause of hospitalization around the globe, affecting the economy and increasing the burden on individuals and society [19]. Consequently, identifying risk factors and implementing preventive interventions have a substantial beneficial effect on public health and the economy [19]. Risk factors can be modifiable or non-modifiable [19]. Modifiable risks include sedentary lifestyle, smoking, and poor diet [19]. Hypertension and diabetes are also modifiable risk factors for CVDs [20]. Non-modifiable risk factors include gender, age, and genetics [10]. The thyroid hormone has a great impact on CVD as it affects the cardiac system and function [19]. More than half of the Saudi population is either hypertensive or pre-hypertensive and one-fifth of the population is diabetic [20].

Risk factors like obesity and hypertension are among the main factors to develop CVD [10]. A Saudi survey conducted on a community-based national epidemiological health study on more than 17,000 adults between 30 and 70 years of age demonstrated the prevalence of obesity in more than 35% of the study group [21]. Various developed countries were able to reduce CVD by 50% when reducing the associated risk factors [10]. Notwithstanding the measures and success in reducing CVDs, CVDs remain the main cause of death in adults over 35 [2]. All treatment applied for CVDs is prescribed for life, which indicates the importance of setting preventive measures as it is the most effective intervention to reduce CAD-associated morbidities and death [2]. Intervention measures should include setting policies and procedures to draw attention to preventing CVD instead of treating CVD patients [10]. Preventive measures are more effective and require fewer resources when applying effective health promotion measures to the population [10].

There are limited studies on the population at risk of developing CVDs in SA, and the difference in onset between the Saudi population and the expatriates [5]. Cardiovascular diseases (CVDs) are the main cause of morbidity and mortality in individuals with diabetes [22], reduced awareness is the reason for the unavailability of early detection and apply preventive measures [22]. For example, a study in Makkah, SA revealed that only 40% of diabetic patients are aware of their higher risk to develop a CVD [23].

A study in Qassim, SA showed that CAD has high prevalence and more than 50% of studied population had more than three risk factors for developing CAD [23]. 50% were obese and had hypertension, and 75% had dyslipidemia [23]. Most of participants had one or more uncontrolled risk factor that demonstrate low level of awareness about the disease, risk factors, and measures to prevent them [23].

MI and acute coronary syndrome can lead to a CVD [1]. MI is due to a sudden stop of blood supply to the heart and can be due to blockage in the blood vessels that supply the heart [1]. MI kills a person every 40 seconds in the US, while the incidence in Saudi is not as high [1]. Nevertheless, the incidence of MI

in SA is increasing with multiple risk factors including obesity, consumption of fatty food, physical inactivity and smoking [1]. Only 42% of the population are aware about MI risk factors, and interventions to reduce its risk [1]. Increasing awareness of risk factors like diet and PA significantly reduces the onset, and recurrence of MI [1].

SA initiated various registries to determine patient with different CVD including, the Saudi Project for Assessment of Coronary Events (SPACE) [24] [25], and Saudi Acute Myocardial Infarction Registry Program (STARS-1 Program) [25]. SPACE provides a comprehensive overview of current diagnostic and treatment strategies for acute coronary syndrome (ACS) patients in SA [24] [25].

The Prospective Urban Rural Epidemiology (PURE) cohort study accumulates information on social, environmental, and individual CVD risk factors [26]. Saudi as a high-income country, reveals many reports containing the effect of demographics (rural vs. urban) areas, and daily lifestyle of the occurrence of CVD [26].

There are a set of tools to assess the risk of Common CVDs, of which is the Framingham Risk Score (FRS) [27]. The study in Abha revealed that the population is at risk of almost 9% developing coronary artery disease (CAD) [27]. Another study on military individuals with supposedly high physical activity demonstrated that 10% of the studied group had a mean risk of almost 5% to develop CVD in ten years [27]. There are no available studies on the general Saudi population and the association of physical inactivity to the risk of developing CVD in ten years [27].

Physical inactivity leads to premature mortality and is a risk factor for various chronic NCD [4]. Physical inactivity is a worldwide issue and according to the WHO, people become less physically active with age [4]. A study in Eastern Saudi described the factors that increase modifiable risk of CVD in which physical inactivity was an identifiable factor [10]. PA boosts the immune system, safeguarding people from infectious diseases, and increases metabolism, which directly affects the risk of chronic diseases [10]. Exercise is a structured, planned, and systematic form of PA [6] [9] [10]. Do not confuse work or home-related activity with the structured movement of a physically active exercise [28]. WHO identified barriers to outdoor exercise like anxiety about traffic & violence, bad climate conditions, and lack of parking, and sidewalks [10]. Research review in Saudi also identified factors like cultural reasons, lack of social support, and proper gyms [10]. Females in Saudi had extra barriers in PA because of the absence of proper facilities, cultural pressure, and lack of time [10]. In addition, despite that, females are more aware than males of the importance of PA, Saudi women are less active than Saudi men [10]. PA is one vital determinant of healthy life [28]. PA maintains a proper weight and reduces the risk of many comorbidities [28]. Less than 20% of young adults are physically active worldwide [28]. In Saudi, only 40% of the whole population is physically active [28]. PA has beneficial results at the individual and community level [4]. There has been rapid modification in the lifestyle in SA with the changes in economy, people are becoming less physically active [4]. People in Saudi do not participate

in physical activity that provides them a healthy standard and protects them from illnesses [4]. One study by Al-Nozha *et al.* concluded that physical inactivity accounts for more than 95% of the population [4]. Another study by Al-Hazzaa concluded that physical inactivity in Saudis ranges from 43.4% to 99.5% between children and adults [4]. PA level had not changed much notwithstanding the many reports that support various benefits of PA [4].

Improper diet high in trans fats [29] that lacks fruits and vegetables, physical inactivity, and obesity are main risk factors to develop NCDs [18]. Obesity prevalence is between 35% - 63.5% in various areas in the kingdom [28]. A study in the US showed that having regular breakfast meal reduced obesity onset in 30% of adolescent [18]. Healthy eating habits have been shown to reduce CVDs, a main subset of NCD [18] [30]. Conversely, low consumption of fruits and vegetables can increase hypertension, and hypercholesterolemia, which are risks to developing CVDs [18].

Vitamins, minerals, and fiber components of fruits, vegetables, and multi-grain products have scientifically proven rolls to reduce oxidative stress, inflammation, high blood pressure, and enhance insulin sensitivity [8]. On the other hand, a diet with high saturated fat and processed carbohydrates increases the risk of CVDs [8]. However, studies in Saudi about the relationship between diet and CVD are lacking, unlike in the US [8]. Moreover, there are no studies in Saudi examining the impact of dietary guidelines on the risk of CVD [8].

The Glycemic index estimates the quality of carbohydrates in a diet [30]. The Glycemic index measures how much 59 g of carbs in a diet will increase blood glucose level [30]. The high glycemic index is caused by a high percentage of the refined diet, while a low glycemic index is demonstrated in healthier, whole food grains [30]. A healthy diet includes high fiber constituents, a low percentage of refined grains, and a low glycemic index [30]. High fiber food low in glycemic index can lower the risk of developing many chronic diseases and hence mortality rate [30].

Trans fatty acids (TFA) are synthetic fat produced by heating liquid oil and catalyzing the oil with hydrogen to convert the oil to solid fat [29]. The heating step involved in the process will transform the carbon double bond to the trans-form [29]. TFA has worse health consequences than saturated fatty acids and is linked to increasing CAD [29]. In addition, TFA increases total plasma cholesterol level and the bad cholesterol low-density lipoprotein (LDL) [29]. Mean percentage of TFA in margarine and butter is 4.25% with SD of 2.025, and 10.75% with SD of 4.925 respectively [29]. Acknowledging the presence of TRA is mandatory in the US by the FDA [29]. In Saudi, the government recently mandated labeling food with TRF content [29]. Labeling is essential to inform the public about the content of their diet that could have a risk of CVD [29].

Proper nourishing diet greatly influences one's health and protection from illness [16]. A balanced diet offers vital nutrients and the addition of dietary supplement deliver a vital source of micronutrients not provided in the diet and that can protect from birth defects [31]. Pregnant and lactating women, the el-

derly, and adolescents with bad eating habits can benefit from dietary supplements [17] [31]. Some dietary supplements have active ingredients that have to be monitored properly for safe uptake [31]. There are reported cases of side effects to clinically unapproved dietary supplement that are sold illegitimately or using over the recommended dose [31]. Evidence of dietary supplements in reducing or increasing the risk of chronic diseases is not clear [31]. Supplements of vitamin B lower the incidence of stroke, but have no effect on CVD [31]. Omega-3 fatty acids also showed no effect on CVD [31]. Studies on dietary supplements are limited in Saudi and not much is known about their effect [31].

Attention to mind and body medicine has changed over the past 30 years [32]. The effect of religious practices has great effect in healing exercises of physiological and psychological diseases [32]. Meditation has direct effect on reducing stress, depression and anxiety among Saudi students [15]. Mayo Clinic has up to 850 studies demonstrating the effect of religious practices on physical and mental health respectively [32]. The majority of these studies showed the positive effect of spirituality in religious practices on the length and quality of life [32]. Religious practices are related to decreasing mortality and morbidity [32]. Religious practices were associated with lower level of smoking, drinking alcohol and depression; consume healthier diet, and a better immune system [32]. Meditation has effects to reduce the risk of CVD as part of guideline-directed cardiovascular risk reduction [32].

Islamic prayer is a form of meditation accompanying PA that is proven to activate the parasympathetic, reduce the sympathetic nervous system, and display slower alpha rhythm coherence on Electroencephalography (EEG) [32]. Prayer or (Salat) also reduces anxiety and influences balance in both adults and elderly [33]. Salat is also a form of physical exercise as many joints and muscles bend and flex during prayer [33]. More than 90% of people pray regularly five times a day and enjoy healthy knee movement [33]. Salat-altaraweeh is a longer form of the regular salat that is practiced during the month of Ramadan and is proven to have a preferable effect on mental health and physical strength [33].

In Summary, this paper is a systematic review investigating the effect of PA, diet and mindful medication on the risk of developing CVD and the severity of the CVD in patient with the disease. risk factors of CVD collaboratively combine and increase the risk of developing a cardiac illness; so, better interventions will attract multiple risks than those interventions that focus on only one risk factor at a time [12].

### 3. Objectives

CVD is the main cause of mortality and morbidity worldwide and in SA. CVD is increasing dramatically in the Kingdom with urbanizations. Identifying risk factors is essential to set proper interventions that can prevent risk factors and slow progression of the disease.

After a thorough review of the literature, the researcher's intention is to iden-

tify the impact of various practices on the risk of developing CVD, and on the severity of patients with the disease.

### 3.1. General Objectives

- 1) Determine the risk factors to develop a CVD in SA.
- 2) Determine risk factors that accelerate progression of the disease in patients with CVD in SA.

### 3.2. Specific Objectives

- 1) Determine the effect of PA, diet, and mindful meditation on the risk of developing CVD.
- 2) Determine the effect of PA, diet, and mindful meditation on the severity/speed of progression of CVD.
- 3) Determine the population's awareness of the effect of PA, diet, and mindful meditation on CVD risk and disease severity.

## 4. List of Abbreviations

<b>ACE</b>	African Middle East Cardiovascular Epidemiological
<b>ACS</b>	Acute coronary syndrome
<b>CAD</b>	Coronary Artery Disease
<b>CHD</b>	Coronary heart Disease
<b>CVD</b>	Cardiovascular Disease
<b>EEG</b>	Electroencephalography
<b>FRS</b>	Framingham Risk Score
<b>GCC</b>	Gulf Council Countries
<b>HDL</b>	high-density lipoprotein
<b>IHC</b>	ischemic heart disease
<b>LDL</b>	low-density lipoprotein
<b>MBCT</b>	Mindfulness-Based Cognitive Therapy
<b>MBSR</b>	Mindful Based Stress Reduction
<b>MBI</b>	Mindfulness-Based Interventions
<b>MI</b>	Myocardial Infarction
<b>NCD</b>	Non-communicable Disease
<b>NTP</b>	National Transformation Program
<b>PA</b>	Physical Activity
<b>PM</b>	Preksha Dhyāna meditation
<b>PURE</b>	Prospective Urban Rural Epidemiology
<b>SA</b>	Saudi Arabia
<b>SPACE</b>	Saudi Project for Assessment of Coronary Events
<b>STARS-1</b>	Saudi Acute Myocardial Infarction Registry Program
<b>TFA</b>	Trans fatty acids
<b>TRS</b>	Trans fatty acids
<b>WHO</b>	World Health Organization

## 5. Materials and Methods

This is a systematic review of published papers on the population of SA, about CVD risk factors and interventions like mindful meditation, physical activity, and diet effect on reducing the risk of developing CVDs and reducing severity in patients with CVDs.

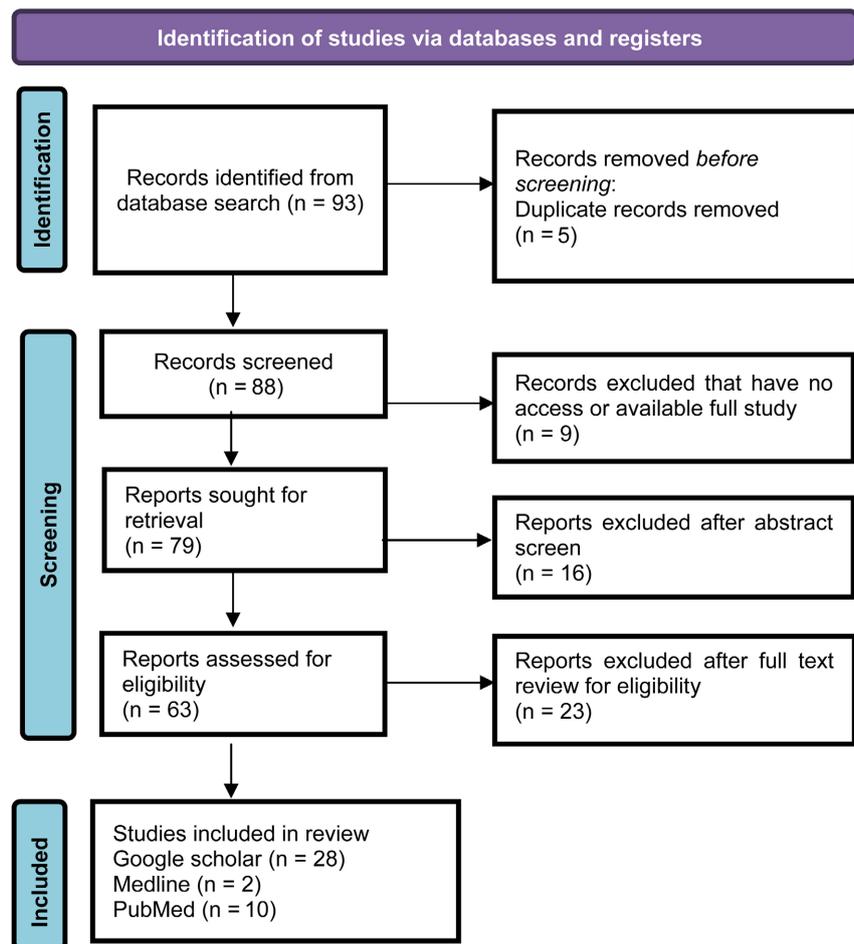
This systematic review is a tertiary research that does not use human material or human data and does not require IRB approval. IRB approval is extracted only for publication and is submitted to the publishing Journal.

### 5.1. Methods

We followed the preferred reporting system for systematic analysis in this research. All steps from the PRISMA analysis are found below in **Figure 1**.

### 5.2. Literature Search Strategy

Electronic database search for literature in Google Scholar, PubMed, and Medline was done in July 2022 by using the following keywords combination: (Cardiovascular diseases OR Cardiovascular disease OR ischemic heart disease OR



**Figure 1.** PRISMA flow diagram for systematic review.

Heart disease OR Coronary artery disease) AND (Saudi Arabia) AND (Risk factors OR Physical activity OR mindful meditation OR meditation OR Diet OR Awareness).

### 5.3. Study Selection

The researcher collected the literature through a database search of the keywords. Screened the topics, and removed duplicates. Papers that had no access to the full article or papers that contained abstracts only were excluded from the study. The remaining papers with the complete article and open access to the full article were then collected and the abstract was screened. Excluded papers, after the abstract screen, where then have their full article screen. The last step included a full article screen to exclude unrelated papers.

### 5.4. Eligibility Criteria

Only researches that satisfied the following eligibility criteria were included: 1) Papers published in the period from (2015-2022), 2) Papers about CVD in the population of SA, and 3) Papers that assess the effect of PA, meditation, and diet on the risk of developing CVDs or on the severity of patients with CVDs. Research that did not suit these eligibility criteria was excluded. Abstract only, duplicates, and research with no access to the full articles were also excluded.

### 5.5. Characteristics of Included Studies

This systematic review has retrieved 93 papers through database search in Google Scholar, PubMed, and Medline. The first screening was to remove duplicates (n = 5), followed by removing articles with only an abstract or without access to the entire research (n = 9). Afterward, abstracts were reviewed for eligibility, and non-eligible abstracts were removed (n = 16). Lastly, a complete research revision revealed non-eligible papers (n = 23), which were removed. A final number of (n = 40) researches were included in the systematic review.

### 5.6. Data Extraction

Data extracted by the sole researcher includes disease characteristics, prevalence, and risk factors. Next, extract data describing the population groups, attitudes, demographical distribution, and socioeconomic factors. The last step was extracting data on the effect of risk factors, awareness about risk factors, and interventions to prevent these risk factors in the population. Sixteen papers have data on PA and its relation to CVDs in SA. Seven papers discussed the relationship between diet to increasing or decreasing the risk of developing CVDs or increasing one or more of the risk factors that lead to the development of CVDs. Two of the seven papers talked about the use of supplements and multivitamins to overcome a poor diet or as a supplement to the diet of vital nutrients to reduce the risk of developing CVDs. Twelve papers mentioned the mixed effect of PA and diet on the risk of developing CVD or the effect on patients with the disease. Only five

papers talked about the effect of mindful meditation, one of which is a clinical trial. This systematic review has included mostly cross-sectional studies and five systematic reviews, only two clinical trials, two retrospective studies, one case-control study, one cohort study, one observational study, three articles summary, and two epidemiological studies.

### 5.7. Quality of Included Studies

All studies included were of good quality. Two of the papers related to mindful meditation were not very well constructed, but were included because of the few numbers of published papers about mindful meditation in SA.

## 6. Results

According to the Global Burden of Disease Study in 2013, the global mortality from CVD at all ages was estimated to be more than 17.2 million worldwide [9]. CVD is the leading cause of disability and death in SA [2], with the age group below 50 most affected [27]. In the Arab world, ischemic heart disease was the leading cause of mortality in 2010, contributing to 14.3% of all deaths [6]. Dyslipidemia, hypertension, metabolic disease, and obesity are risk factors for CVD [5] [21] [28] [29] [30]. Hypertension is a risk factor in almost 70% of patients with Acute Coronary syndrome (ACS) [34]. Depression is a risk factor for CHD but not anxiety [35].

Urbanization in SA dramatically changed the lifestyle of the Saudi population [5]. Females with medium educational levels showed the highest level of obesity, high blood pressure, and cholesterol, which can be attributed to the lower level of awareness about the importance of physical activity in reducing various chronic diseases [7]. Female in the eastern region was found to have the highest prevalence of diabetes, hypertension, and obesity than any other region [7].

Hypertension increasingly affects women older than 40 years [10]. Diabetes also increased with age in men and women [3] [10] [36]. In contrast to hyperthyroidism, hypothyroidism showed a higher association with CVDs like heart failure and ischemic heart disease [19]. Therefore, it is crucial to identify the risk factors to manage the poorly controlled modifiable risk factors [5]. PA, mindful meditation, and diet have been identified to modify and lower those risk factors leading to CVD. Refer to **Table 1** for the summary of studies in this systematic review.

### 6.1. Effects of PA

Physical inactivity is main cause of premature mortality [18]. PA is highest in the adolescent age group and lowers as people age to reach their lowest level after 65 years [4]. Awareness level of physical inactivity as a risk factor to CVD is less than 40% [2]. Saudi female in the age group 42 - 51 years had a high prevalence of obesity, while diabetes and high blood pressure was more prominent in 52 years aged and above [7]. These findings are attributed to reduced PA and

**Table 1.** Summary of included studies.

SN	Author, year	Sample size	Sampling method	Key Findings
1	Alanazi <i>et al.</i> , 2020	123	Cross-sectional study	Low awareness level in patients with acute myocardial infarction about modifiable risk factors like diet, PA, and obesity.
2	Almalki <i>et al.</i> , 2019	468	Cross-sectional study	Three-quarter of the participants were aware about the risk of fast food and to lesser extent consuming soft-drinks.
3	Ghamri <i>et al.</i> , 2019	250	Cross-sectional study	Coronary heart disease (CHD) is the third cause of death in hospitalized patients after car accidents and old age. Patients with CHD mentioned that they are consuming unhealthy diet according to their physicians. Barriers to PA include disability or issues from current illness. Women had higher risk to CVD than men.
4	Alqahtani <i>et al.</i> , 2021	26,000	National Survey	PA was shown to be highest in adolescent age group and lower as people age to reach its lowest level after 65 years. Barriers to PA include lack of available facilities and lack of desire.
5	Ahmed <i>et al.</i> , 2017	550	Cross-sectional epidemiological analysis	Epidemiological studies are essential to develop a clear idea about the risk factors of CVDs and implement interventions to manipulate them. Most prominent risk factors are dyslipidemia and abdominal obesity, which are found in 75% of the participants in all age groups, both male and female. 50% of these patients did not get treatment, and those on treatment did not show good lipid-profile results.
6	Al-Zoughool <i>et al.</i> , 2018	303	Cross-sectional study	PA enhance the life style of all ages through school and working years similarly. PA reduces the level of hypertension. Hypertension have an accumulative effect to increase the risk of developing CVDs.
7	Al-Bakr <i>et al.</i> , 2016	1233	Cross-sectional study	Females with medium educational levels showed the highest level of obesity, high blood pressure, and cholesterol, which can be attributed to the lower level of awareness about the importance of physical activity in reducing various chronic diseases. Female in the eastern region was found to have the highest prevalence of diabetes, hypertension, and obesity than any other region.
8	Alkhalidy <i>et al.</i> , 2019	80	Preliminary Cross-Sectional Study	Saudi diet guidelines revealed that CVD patients consumed less fruits, vegetables and non-alcoholic bear.

## Continued

9	Alahmed & Lobelo, 2018	>50,000	Summary of articles	PA is a beneficial indicator to promote physical and mental health and prevent disease. PA reduces depression, diabetes, high blood pressure, CVDs, and cancers including breast and colon. counseling in PHC promoted increase patients' awareness about the importance of PA and led to increasing the level of PA in those patients.
10	Alshaikh <i>et al.</i> , 2016	61 studies	Systematic review	Hypertension was low among students but reached above 20% in women older than 40years. Rate of diabetes increased in elderly men.
11	Almaqhwawi, 2022	12	Semi-structured interviews	Establish a pricing strategy to decrease the prices of participating in gyms. Educate the public through social media about the importance of PA. Aware family parents encourage their kids to participate in more PA related practices.
12	Khouja <i>et al.</i> , 2020	31	Randomized controlled trial	Younger age patients shown to improve better when ethane the function of risk factors to CVD.
13	Al-Ghalib & Salim, 2018	60	Quasi experiment	Mindful meditation has increased physical, spiritual and psychological awareness, lowered the level of anxiety, and enhanced the quality of life. Professionals believe it is essential to introduce mediation, including religious practices, as a psychological intervention for various chronic diseases.
14	Alkhabaz <i>et al.</i> , 2022	3947	Systematic analysis	Meditation was shown to reduce stress, anxiety, and SBP. MBSR showed to dramatically reduce SBP and DBP in prehypertensive patients. There was no significant change in stage 1-hypertensive patients who did not take their medications.
15	Abomoelak <i>et al.</i> , 2022	142	Clinical trial	494 genes that have brain function, muscle and cardiac relaxation had significantly differential response. PM upregulated TIN gene that is vital for skeletal and cardiac muscle synthesis.
16	Alissa <i>et al.</i> , 2018	210	case-control study	AEHI supplements the body with enough ascorbic acid, carotids, fibers, omega-3-fatty acids, and other essential nutrients for healthy cardiac function. diet quality as measured by Alternate Healthy Eating Index (AHEI) and coronary risk as determined by carotid artery intima-media thickness (CIMT) among Saudi adults.

## Continued

17	Algaeed <i>et al.</i> , 2019	679	Cross-sectional study	Many believe that dietary supplements and multivitamins can cover-up for the shortage of poor diet, and are aware about the side effects of overusing them. Pharmacists and internet search were among primary methods to get supplement information.
18	Alasqah <i>et al.</i> , 2021	>14,000	Systematic review	PA among school kids range from 4% to below 45%. A positive correlation seen between healthy eating fruits, vegetables, and PA. Barriers to PA include lack of transportation and family support, and lack of well-priced facilities.
19	Altaleb <i>et al.</i> , 2017	181	Cross-sectional study	Hypothyroidism in contrast to hyperthyroidism showed higher association with CVD including heart failure, and ischemic heart disease.
20	Mujammamiet <i>et al.</i> , 2020	1167	Cross-sectional study	There was no difference in awareness among groups with different educational level. Northern Riyadh population had more awareness than other parts of Riyadh.
21	El-Ashker <i>et al.</i> , 2021	284	Cross-sectional study	A Saudi survey conducted on a community-based national epidemiological health study on more than 17,000 adults between 30 and 70 years of age demonstrated the prevalence of obesity in more than 35% of the study group. Number of Prehypertension and obesity cases is increasing in young adults in Saudi.
22	Alduraywish <i>et al.</i> , 2022	383	Cross-sectional study	Age was a vital factor to determine level of awareness. Saudis more than 40 years old are more aware about CVDs and risk factors.
23	Albadrani <i>et al.</i> , 2020	1042	Cross-sectional study	Awareness level was different among different demographic levels like education, and social status.
24	AlFaleh <i>et al.</i> , 2015	2031	Metacentric, observational study	Referral to cardiac catheterization after MI is associated with socio economic level.
25	Cader <i>et al.</i> , 2022	not mentioned	Summary of articles	SA initiated various registries to determine patient with different CVD including, the Saudi Project for Assessment of Coronary Events (SPACE), and Saudi Acute Myocardial Infarction Registry Program (STARS-1 Program).
26	Alhabib <i>et al.</i> , 2020	2047	cohort study	Most prevalent risk factors in the Saudi population are low PA in 66.6%, obesity in 50%, eating junk food, and hypertension in 33.3%, 25% being diabetic, and have dyslipidemia.

## Continued

27	AlQuaiz <i>et al.</i> , 2019	2997	Cross-sectional study	Age group below 50 years had the most prevalent cases of CVD in SA.  Hypercholesterolemia is associated with decreased PA. Hypercholesterolemia increases the risk of CVD due to the formation of atherosclerotic plaques. PA maintains a proper weight and reduces the risk of developing much comorbidity.
28	Alreshidi <i>et al.</i> , 2020	304	Cross-sectional study	Food products like mozzarella cheese, butter, and whipping cream are found to be high in trans fats. Cakes, pies, bread, crackers and samposa have even higher percentage of trans fats that reached to more than 90%. Food labeling of zero trans-fat doesn't mean it is free from trans-fat which is a point that needs educational programs among the Saudi population.
29	Kamel & Otaibi, 2018	181	Cross-sectional study	High fiber food low in glycemic index is proven to lower the risk of developing many chronic diseases and hence mortality rate.
30	Jenkins <i>et al.</i> , 2021	137,851	Prospective Urban Rural Epidemiological Study	Mostly used supplements arranged in decreasing percentage of use are multivitamins, Vitamin D, iron, calcium, omega-3, vitamin B and folic acid. Many of supplement users donot have full information about the supplements they use.
31	Alowais <i>et al.</i> , 2019	351	Cross-sectional study	Prayer, which is a type of meditation and PA have shown to reduce SBP and DBP. As meditation, prayer increases the sense of security and boosts mental health.
32	Chamsi-Pasha <i>et al.</i> , 2021	not mentioned	Summary of articles	Salah is a form of meditation that stimulate parasympathetic nervus system, reduces anxiety and influences balance in both adults and
33	Osama & Malik., 2019	34	Systematic review	Dyslipidemia is a strong risk to ACS especially in male. Diabetic is a single most prominent risk to develop ACS with increases death rates compared to ACS patients without diabetes.
34	Alhassan <i>et al.</i> , 2017	156	retrospective descriptive study	A study of 34 interventions involving PA, showed almost only one third reduction in anxiety, whereas two thirds showed no effect of PA in reducing anxiety. Depression as a risk factor to CHD rather than anxiety.
35	Farquhar <i>et al.</i> , 2018	158	Systematic review	Working age individuals who had favorable risk profile and low expenditure on healthcare are found to have healthier, and longer span of life after the age of 65 [33].
36	Gutierrez <i>et al.</i> , 2018	432	Cross-sectional study	

## Continued

37	Alzahrani <i>et al.</i> , 2019	92	Cross-sectional study	Some physicians are not interested to identify secondary risk factors of CVDs.
38	Shehab <i>et al.</i> , 2020	15,532	Registry Review	Men have found to have more information about guidelines to recommendations of drugs use after hospital discharge than women. Women younger than 65 years have higher rate of in-hospital mortality than men do.
39	Takieddin <i>et al.</i> , 2022	615	retrospective records review	ACS, a risk factor to CDV, has a high recovery rate of more than 99%. Men are more susceptible to ACS and have higher lipid profile than women admitted to hospitals.
40	Alzahrani <i>et al.</i> , 2019	854	Cross-sectional study	CVD is increasing significantly among Low- and middle-income individuals and their families. This increase is accompanying the rapid economic change in the SA leading individuals to be more sedentary, consume poor diet, and smoke more.

pregnancy at these ages [7]. Another study found no significant correlation between obesity, high blood pressure, diabetes, cholesterol, and PA [7]. Obesity was found to be correlated with more sedentary behavior [21]. A sedentary lifestyle was found to increase the risk of developing CVD [6]. Being sedentary for less than six hours slightly increased the risk of developing CVD while being sedentary for more than six hours showed an increase in the intensity of the risk [6].

High-intensity PA was not associated with lowering the risk of CVD; the same is seen with free walking [6]. On the other hand, occupational-associated PA reduced the risk of developing CVD [6]. Moderate occupational PA reduced the risk of CVD to more than 50% [6]. The level of PA varied in different Saudi regions, age, and gender [18]. PA is lowest in north Saudi [28]. Less than 44% of men and 13% of women met the daily requirement level of PA [18]. Only 15% of adolescents met the daily requirement level of PA, and 35% reached the accepted level of activity [18]. Women appeared to be more sedentary than men, and men participated in PA for more extended periods than women [18]. Time spent in PA for leisure compared to other reasons is less than 100 min and less than 80 min per week, respectively [18].

## 6.2. Effects of Mindful Meditation

Abomoelak *et al.* (2022) examined the effect of Preksha Dhyāna meditation (PM) on healthy individuals for eight weeks to determine the cellular and molecular mechanism of specific genes [15]. PM Sessions include relaxing periods as in yoga, but most PM practice concentrates the attention on brain function [15]. PM is known for its effect on healthy individuals to improve their intellectual

(cognitive) skills and relieve stress, but studies on the underlying cellular mechanism are lacking [15]. In his study, Abomalek found that PM Upregulated more than 136 genes, and downregulated more than 350 genes compared to control samples [15]. MJTP, another program of meditation techniques, were implemented in SA and is aligned with cultural and Islamic religion [13]. MJTP includes breathing techniques to increase the depth of inhalation and exhalation [13]. The study of MJTP also allows relaxation and practice to be present in the now to get a more profound sense of oneself and focus on aligning the mind, heart, and soul [13]. Other meditations like MBI include practices like Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT) [14]. MBSR is a form of meditation designed for stress management, while MBCT combines cognitive therapy with meditation and mindfulness [14]. MBSR showed to dramatically reduce systolic (SBP) and diastolic blood pressure (DBP) in prehypertensive patients [14]. However, there was no significant change in stage 1-hypertensive patients who did not take their medications [14]. Conversely, there was a significant reduction in SBP and DBP of hypertensive patients after two months of MSRB intervention [14].

### 6.3. Effects of Diet

Diet and sedentary lifestyle significantly contribute to the increased number of CVD [16]. The African Middle Eastern Cardiovascular Epidemiological (ACE) study demonstrated that among the most prominent risk factors of CVDs are dyslipidemia and abdominal obesity, which are found in 75% of the participants in all age groups, both male and female [5]. In addition, 50% of these patients did not get treatment [5], and those on treatment did not show good lipid-profile results [5] [22]. A study by Albadrani *et al.* (2020) revealed that 80% of school kids consume up to two fast-food meals weekly or at least once daily [18]. Unhealthily eating habits continue to rise, with more than 50% skipping breakfast [18]. In addition, many school kids did not eat fruits and vegetables regularly [18]. In Almalki *et al.* (2019) study, Three-quarters of the participants were aware of the risk of fast food and, to a lesser extent were aware of the risk of consuming soft drinks to develop CVD [2]. Consuming soft drinks also increases the risk of diabetes [2]. Moreover, less than 1% knew that a history of stork increases the risk of developing CVD [2].

Women have lower levels of diabetes, obesity with BMI 30 - 35, ischemic heart disease, and INTERHEART risk score. On the other hand, women have higher obesity with BMI > 35, higher central obesity, more stress, unhappy episodes, and are less educated [26]. Age as a risk factor showed that the elderly were less physically active, had lower education, and had higher rates of hypertension, diabetes, heart failure, and ischemic heart disease [26]. People living in rural areas had higher BMI than those in urban areas [34]. People in urban areas consume junk food, are sad, and are under constant stress to a greater extent than in rural areas [34].

Alternative Healthy Eating Index (AHEI) is a diet with large portions of vegetables, fruits, seafood, legume, and whole foods [16]. AEHI supplements the body with enough ascorbic acid, carotids, fibers, omega-3-fatty acids, and other essential nutrients for healthy cardiac function [16]. The Mediterranean diet is replacing [8] [16] the western diet, which is full of trans fats, refined grains, and high sugar content [8] [16] [28]. The Mediterranean diet reduced the death rate from CVD [8]. In addition, Extraversion olive oil reduced the mortality rate in high-risk CVD patients [8]. The Saudi diet guidelines affect the level of SBP, cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglyceride, waist measure, and BMI [8]. The diet guidelines include high vital nutrients like fibers and polyphenols [8]. There was no difference in cholesterol, LDL, and triglycerides in CVD and their regular counterparts [8]. Only HDL showed a significant increase in CVD patients compared to the control group, which can be attributed to their medications that increase HDL levels [8]. CVD patients show very high potassium and very low levels of chloride [8].

In Algaeed *et al.* (2019)'s study, single Saudis practice has multivitamins and dietary supplements more often than other married Saudis [17]. nearly 60% spend less than 200 SR, 33% spend between 200 and 500 SR, and less than 7% spend more than 500 SR monthly [17]. Almost half of the participants knew the usefulness of multivitamins and dietary supplements. At the same time, 12% did not know about the supplements and their use [17]. Less than 40% have never used supplements, and almost 30% knew a relative who used them [17] Almost 32% used multivitamins and vitamins, 26% used fatty acids, 24.3% used minerals, and 18% used amino acids and proteins [17]. Most participants agreed on the usefulness of multivitamins and dietary supplements accompanied by medical treatment for better outcomes, while only 15% refused the idea [17]. Women [17] [31] and healthier individuals who ate better and did not smoke are more users of multivitamins and dietary supplements [17], and so are people with higher educational levels [17] [22] [23]. Less than 60% of pills consumers consider their physician's advice and, to a lesser extent, their friend's or family's advice [17].

## 7. Discussion

CVD is increasing significantly among low- and middle-income individuals and their families [37] [38]. This increase accompanies the rapid economic change in the SA, leading individuals to be more sedentary, consume a poor diet, and smoke more [37]. The number of Prehypertension and obesity cases, which increase the risk of CVD, are also increasing among young adults in Saudi [21]. Working-age individuals with favorable risk profiles and low expenditure on healthcare are found to have a healthier and longer life span after age 65 [36]. Younger age patients are shown to improve better when enhancing the function of risk factors for CVD [12]. Ahmed *et al.* (2017) identified that almost half of the study's population had more than three risk factors for CVD [5].

Less than one-fifth of the participants had only one risk factor [5]. Patients with CVD have higher cholesterol levels, hypertension, and diabetes and lower education than the control group [6] [10] [27]. Almost 61% of the participants in Alhabib *et al.* (2020) were aware of their hypertension, of which two-thirds had treatment and one-third had their blood pressure controlled [26]. There was no significant change in stage 1-hypertensive patients who did not take their medications [34]. Nearly 60% of ACS patients have ischemic heart disease (IHD), which makes them more susceptible to coronary death [34]. Dyslipidemia is a severe risk of ACS, especially in males [34]. However, the relationship between dyslipidemia and ACS differs in different studies, which may indicate the presence of another factor like demography [22] [23] [26] [34]. On the other hand, diabetes is the single most prominent risk of developing ACS, with increased death rates compared to ACS patients without diabetes [34]. On the other hand, hypertension, which increases with age, has a similar risk for men and women developing ACS [34].

### 7.1. Effects of PA

Participants identified PA as a beneficial indicator to promote physical and mental health and prevent disease [9] [11]. A study of 34 interventions involving PA showed almost only a one-third reduction in anxiety, whereas two-thirds showed no effect of PA in reducing anxiety [35].

Al-Bakr *et al.* (2016) found no correlation between obesity, high blood pressure, diabetes, cholesterol, and PA [7]. However, PA was found in other studies to positively improve physical and mental health and reduce the risk of CVD [5]. There was a low negative correlation between PA and sedentary behavior [27]. Hypercholesterolemia is also associated with decreased PA [28]. Patients with hypertension have reduced PA levels, which increases the risk of CVD [6] [28]. This indicates an accumulative effect on increasing the risk of developing CVD as hypertension is by itself a risk factor [6]. In the study by Alanezi *et al.* (2020) only 39% of participants believed there was a relationship between PA and the risk of developing a heart attack, while almost 55% did not know any association [1]. Counseling in PHC promoted increased patients' awareness of the importance of PA and increased the level of PA in those patients [9]. Counseling included guidelines for proper PA, evaluating awareness, promoting PA, and identifying barriers [9] [11]. PA among school kids ranges from 4% to below 45% [18]. Aware family parents encourage their kids to participate in more PA related practices [11]. Refining muscle shape and mass, building strength, and preventing weight were among the primary reasons school kids indulged in PA [18]. Healthier lifestyle in early life contributes to better health in adulthood free from NCD like CVDs [36]. On the other hand, barriers to PA include lack of available facilities, lack of desire [21], lack of support from family and friends [11] [18]. Other barriers include lack of transportation to the gym which reduces Saudi's interest in PA [4] [11].

## 7.2. Effects of Meditation

Of the 494 genes studied that have brain function, muscle and cardiac relaxation had a significant differential response [15]. PM upregulated the *TIN* gene vital for skeletal and cardiac muscle synthesis [15]. MBCT and MBSR models positively reduce stress, depression, and high blood pressure in patients with CVD after three weeks of practice [14]. Nevertheless, another study performed over three weeks, two and half months, and three months on a mix of healthy and Patients with CVD showed no substantial effect of meditation on reducing blood pressure [14]. Brief periods of mindful breathing have been shown to decrease BP in patients with hypertensive patients [14]. Prayer, a type of meditation and PA, has been shown to reduce SBP and DBP [32].

## 7.3. Effects of Diet

Coronary heart disease (CHD) is the third cause of death in hospitalized patients after car accidents and old age [3] [39]. According to their physicians, patients with CHD mentioned consuming an unhealthy diet [3]. Ahmed *et al.* (2017) study found that dyslipidemia was the most identified risk factor [12] [20] [30] [36] and was present in 70% of the patients [5]. Hypertension came second as it was present in less than 50% of the participants [5]. Diabetes was present in 25% and obesity in almost 45% of the patients [5]. The study also included a comparison between Saudi nationals and expatriates and showed that Saudis had higher BMI than expatriates. In comparison, expatriates had higher hypertension, diabetes, and dyslipidemia [5].

Food products like mozzarella cheese, butter, and whipping cream are high in trans fats [29]. Cakes, pies, bread, crackers, and samposa have an even higher percentage of trans fats, reaching more than 90% [29]. Food labeling of zero trans-fat does not mean it is free from trans-fat, which is a point that needs educational programs among the Saudi population [29]. Patients with acute myocardial infarction had a low level of awareness that fatty food is a risk for the disease [1] [23]. Almost 37% knew there was a correlation between fatty food and acute myocardial infarction, while almost 40% did not know fatty food poses a risk of developing the disease [1]. Less than 5% acknowledged that fatty food increases the risk of a heart attack [1]. Less than a quarter of the participants value fruits and vegetables' benefits in reducing heart attack [1] and coronary heart disease [8]. Interestingly, less than 10% of the participants indicated that fruits increased the risk of developing a heart attack [1]. 77.2% had wrong responses [1] related to the diet about the risk of developing a heart attack [7] [34] [35] which indicates a low level of awareness [1]. More than 50% believed that there is a correlation between obesity and heart attack, while only a few did not make the correlation [1]. Awareness level was different among different demographic levels like education, and social status [11] [12] [16] [22] [23] [26] [27]. Nevertheless, another study showed no difference in awareness among groups with different educational levels [20].

Primarily used supplements, arranged in decreasing order of use, are multivitamins, Vitamin D, iron, calcium, omega-3, vitamin B, and folic acid [31]. Many believe that dietary supplements and multivitamins can cover the shortage of poor diet and are aware of the side effects of overusing them [17]. These products are available over the counter and can be bought without a prescription [17]. Pharmacists and internet search were the primary methods to get supplement information [31]. The most prevalent risk factors in the Saudi population are obesity in 50%, eating junk food and hypertension in 33.3%, 25% being diabetic [26], and dyslipidemia [26] [28]. In addition, hypercholesterolemia increases the risk of CVD due to the formation of atherosclerotic plaques [28].

The PURE study assesses risk factors like consuming a junk diet to CVD among different age groups, gender, and geographical distribution [26]. More men have diabetes than women [26]. Diabetes doubles to quadruple the risk of developing CVD [26]. Diabetes also increases sedentary behavior [28]. Moreover, according to the PURE study, hypertension is prevalent in 33.3% of studies, of which 50% are identified and started treatment, and only 20% have a controlled level of hypertension [26]. The cost of treatment of hypertension is the main reason for untreated hypertension cases worldwide [26]. This is not the case in SA because the treatment is free and accessible to Saudis [26]. Barriers to treating hypertension in Saudi are related to non-adherence to medications, poor patient-physician coordination, fear of side effects, and treatment only when symptoms occur, disregarding preventive measures and screening [26]. Obesity is a risk factor for developing CVD in half of the Saudi population [26]. According to a PURE study, females are more obese than males, which could be due to cultural and social factors [26]. The PURE study revealed that higher rates of CVD occur in rural areas with more prevalent comorbidities like diabetes, hypertension, and obesity [26]. This finding can be related to the term “urbanization of rural areas,” with rural agriculture areas having more machinery to aid farming and introducing road vehicles [26]. Urbanization of rural areas leads to more sedentary life and increased air pollution with fewer protective and preventive measures due to a lower level of education [26].

## 8. Conclusions

CVD is the cause of premature death, and the mortality rate may rise to 25 million in 2030 due to heart disease and stroke [19]. Increased prevalence of risk factors like dyslipidemia, hypertension, and diabetes, especially in younger age groups, is overwhelming and is increasing CVDs [3] [34] [36]. Saudis have increased risk factors for developing atherosclerosis and more cases of atherosclerosis than their expatriate counterparts [24]. There is limited knowledge among some PHC physicians about CVD management and advanced treatment options [5]. Some physicians are not interested in identifying secondary risk factors of CVDs [40]. Public health stakeholders [5] must take it upon themselves to implement measures, increase awareness about modifiable risk factors, and imple-

ment systematic well-developed preventive plans [2] [5] [6] [34] [37]. Preventive measures include awareness programs about trans-fat in diet [29], the importance of PA, and the adoption of National Guidelines that support and inspire PA [5]. School kids consumed low amounts of fruits and vegetables [18]. In addition, older school kids spend more time with their friends than with their families, which may contribute to eating more fast food and staying home playing video games [18] instead of outdoor activities due to the harsh weather in Saudi [11] [18].

Dietary supplements and multivitamins are available on-the-counter drugs [17] [31]. Many are aware of the benefits of supplying the body with missing nutrients in the diet and their harmful effect from overuse [17]. Purchasing dietary supplements and multivitamins does not have a negative financial impact as most users pay less than 200 SR monthly [17]. The awareness is less among those with lower socioeconomic status [16] [17] [31]. Many supplement users do not have complete information about their supplements [31]. Educating the public through social media is essential as many use the internet for information [31]. Moreover, incorporating this health information into the curriculum can spread the knowledge to school kids and college students as this is the age they start taking supplements [31].

PA increases metabolism and brain function, enhancing losing weight, blood circulation, and hormonal functions [11]. In addition, PA reduces depression, diabetes, high blood pressure, CVDs, and cancers, including breast and colon [9]. PA was also shown to increase the family bond and create better relationships with family members [11].

Meditating prayer increases the sense of security and boosts mental health [32]. The postures practice during prayer activates various body muscles and organs [33]. Stretching, bending, and contracting body muscles during prayer promote physical health [33]. Meditation as part of prayer reduces SHR & DHR, regulates heart rate, and promotes mental health [33].

## 9. Recommendations

Saudi Vision 2030 has primary healthcare transformation plans to reduce the rising number of CVD by incorporating preventive measures through PHC [26]. The public in SA is unaware of the risk factors for developing CVDs [2] [20] [23]. Mean age of 32 years; participants were aware of only 66.7% of the risk factors to develop a CVD [23]. More than 59% of participants had no acquaintances about risk factors for CVDs [23]. Saudi plans to reduce the mortality rate of CVDs by a quarter in 2025 by improving the population's daily habits and increasing awareness [26]. Saudis have the highest prevalence of diabetes worldwide, according to the pure study [26], and at younger ages than the median worldwide [28]. According to the PURE study, poor lifestyle contributes to the rising number of CVDs in SA [26]. Poor lifestyle includes consuming unhealthy diet including junk food that is full of trans fats and unneeded calories, and sugary drinks, and long hours of sedentary behavior with no PA [26]. Many people

are unaware of the dietary guidelines and how to differentiate between healthy and junky food [16]. Poor awareness about healthy dietary guidelines was associated with increased susceptibility to asymptomatic atherosclerosis [16]. However, individuals with and without asymptomatic atherosclerosis have similar diet habits [16]. Therefore, more efforts are needed to refine the Saudi dietary guidelines [8] [16]. It is also vital to set educational material in schools and as public awareness programs through social media and target the lower social level [12] [23]. Though diet is a significant risk factor for CVDs, caloric intake could be a confounder [16]. Further research is needed to identify the association between following the Saudi dietary guidelines and the risks of CVD [8]. Recommendations are needed to establish a pricing strategy to decrease the prices of participating in gyms [11]. Educate the public through social media about the importance of PA including time needed to spend practicing daily and the type of exercises according to the age and health status [11].

Moreover, Salat, a combined form of PA and meditation if practiced properly with mindful concentration and stillness has tremendous effects to lower risk factors of CVDs [26]. Awareness about the importance of Mindful concentration during prayer or mindful meditation in general will have promising effects [26]. Yet, not much research is performed on the mindful meditation field in SA [26]. Many studies on mindful meditation are done elsewhere and show encouraging results [26]. So, more research is needed to be implemented in SA regarding mindful meditation to see the effect on the Saudi population and spread the knowledge to increase awareness, because meditation as a practice other than daily prayer is considered new to the culture of SA [26].

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### **Declaration**

I declare that the research project entitled “Effect of Mindful Meditation, Physical Activity, and Diet to Reduce the Risk to Develop or Reduce Severity of Cardiovascular Diseases in Saudi Arabia: A Systematic Review” submitted to the Saudi Electronic University is my own original work. I declare that the research project does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.

### **Conflicts of Interest**

The authors declare no conflicts of interest regarding the publication of this paper.

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