

many things that can raise risk for heart disease. They are called risk factors. Some of them

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cannot control, but there are many that can control. Making healthy changes to lifestyle can help prevent and manage heart disease. Some factors that can affect heart health include depression, chronic stress, excess weight, physical inactivity, trouble sleeping,

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smoking, or substance use. A healthy heart is central to overall good health. Embracing a healthy lifestyle at any age can prevent heart disease and lower risk for a heart attack or stroke. Choosing healthier foods and exercising are two of the best ways to contribute to

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good heart health.

2. Methods

2.1. Eligibility Criteria

The articles that met the following inclusion criteria were included in the systematic review:

- I. Study Design. Cross-sectional studies, prospective studies and cohort studies.
- II. Outcome. Studies that provide quantitated outcomes (magnitude, frequency, or prevalence of heart diseases).
- III. Study Area. Studies conducted in developed and/or developing countries.
- IV. Language. Full-text articles published in the English language.
- V. Population. Healthcare workers, medical students and patients regardless of their occupation.
- VI. Publication Issue. Articles published in peer-reviewed journals from 1989 to 2016

On the contrary, case reports, case series, qualitative studies, review articles, surveillance data/reports, conference abstracts, personal opinions, articles written in non-English language, high risk of bias articles, study not available in full texts, and studies published before 1989 were excluded from the study.

2.2. Information Sources and Search Strategy

The articles were searched using nine electronic databases (PubMed, Google Scholar, CINAHL, MEDLINE, Cochrane library, Web of Science, SCOPUS, MedNar, and ScienceDirect) using a combination of Boolean logic operators (AND, OR, and NOT), Medical Subject Headings, and keywords such as Coronary Heart Disease; Risk factors; Secondary Prevention; Cardiac Rehabilitation; Lifestyle; Systematic Review.

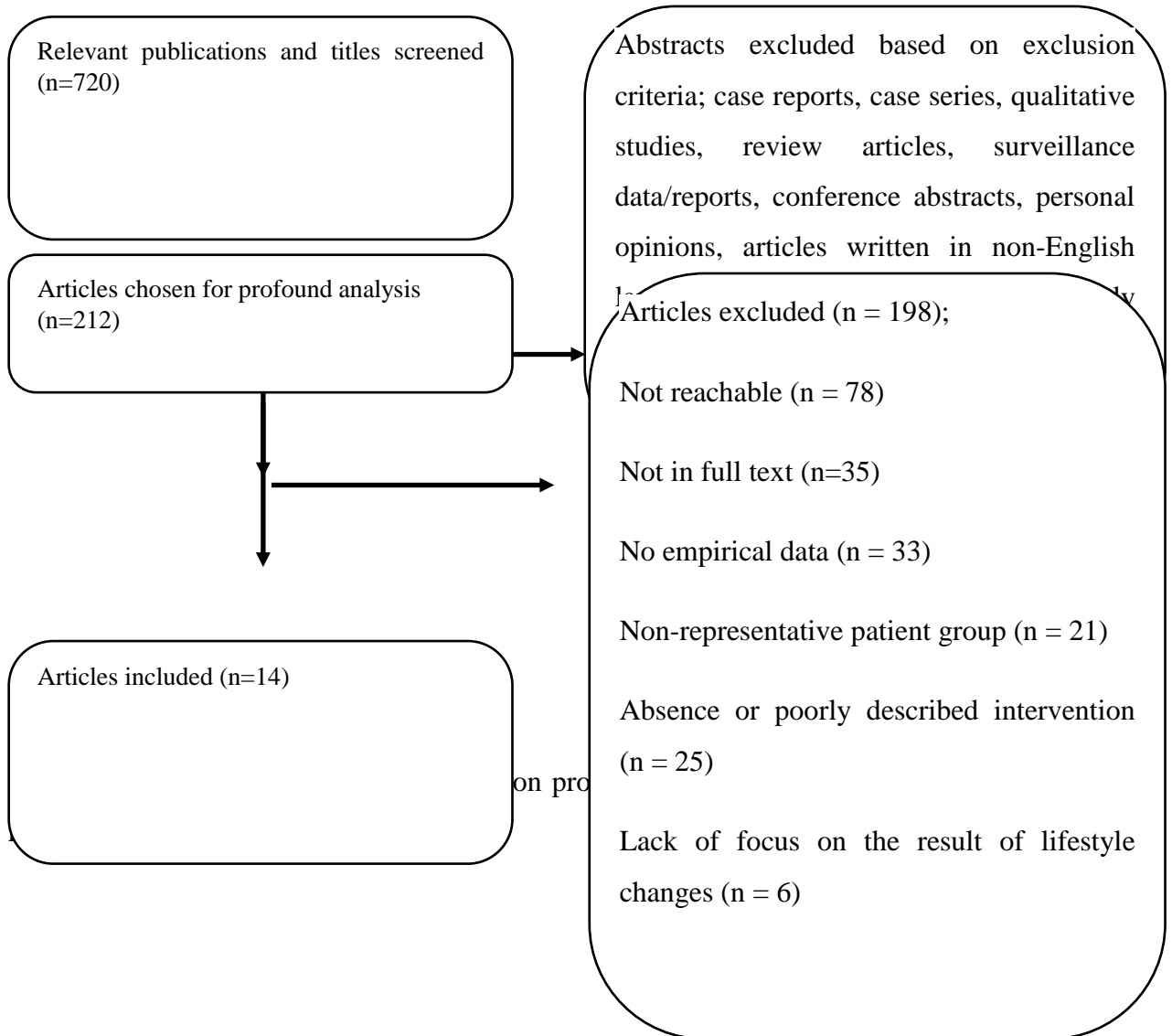
The articles were searched using a combination of Boolean logic operators (AND, OR, and NOT), Medical Subject Headings (MeSH), and keywords. The following is a search term used in the initial searching ((("Coronary Heart Disease"[MeSH Terms] OR "Coronary Heart Disease"[All Fields]) AND (("Risk factors"[MeSH Terms] OR "Risk factors"[All Fields], OR "Secondary Prevention;"[All Fields] OR "Secondary Prevention;"[MeSH])) AND ("Cardiac Rehabilitation"[MeSH Terms] OR ("Cardiac Rehabilitation"[All Fields] AND "Lifestyle"[All Fields]) OR "Lifestyle" [All Fields])).

3. Results

3.1. Study Selection

A total of 720 studies published from 1989 to 2016 were identified. Then, 508 duplicate articles were excluded based on the exclusion criteria. Furthermore, 212 full-text studies were further assessed to determine their eligibility, of which 198 studies were excluded as they not reachable, not in full text, no empirical data, non representative patient group, absence or poorly described intervention and lack of focus on the result of lifestyle changes.

Finally, 14 articles that met the inclusion criteria were included in the review (Figure 1).



SL NO	Article	Sample	Study Procedures	Key Results
1	Karen A. Matthews, Ph.D., Elaine Meilahn, M.P.H., et al, (1989), Menopause and Risk Factors for Coronary Heart Disease, N Engl J Med 1989; 321:641-646	541 healthy, initially premenopausal women 42 to 50 years of age	<ul style="list-style-type: none"> • Prospective study • Self-reported questionnaires 	<ul style="list-style-type: none"> • In women who had a natural menopause and did not receive hormone-replacement therapy, serum levels of high-density lipoprotein (HDL) cholesterol declined as compared with those of premenopausal controls (-0.09 vs. 0.00 mmol per liter; P = 0.01), and levels of lowdensity lipoprotein (LDL) cholesterol increased (+0.31 vs. +0.14 mmol per liter; P = 0.04).

2	Dean Ornish, MD; Larry W. Scherwitz, PhD; James H. Billings, PhD, (1998), Intensive Lifestyle Changes for Reversal of Coronary Heart Disease, JAMA, December 16, 1998— Vol 280, No. 23	Forty-eight patients with moderate to severe coronary heart disease	Randomized controlled trial	<ul style="list-style-type: none"> • In the experimental group, the average percent diameter stenosis at baseline decreased 1.75 absolute percentage points after 1 year (a 4.5% relative improvement) and by 3.1 absolute percentage points after 5 years (a 7.9% relative improvement). • In contrast, the average percent diameter stenosis in the control group increased by 2.3 percentage points after 1 year (a 5.4% relative worsening) and by 11.8 percentage points after 5 years
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3	Iseu Gus, Airton Fischmann, et al, (2002), Prevalence of Risk Factors for Coronary Artery Disease in the Brazilian State of Rio Grande do Sul	1,066 adults older than 20 years in the Brazilian State of Rio Grande do Sul	Observational, cross-sectional study	The sample composition was of 51.8% females. The risk factors prevalences were: 1) sedentary lifestyle 71.3%; 2) familial antecedents: 57.3%; 3) overweight/obesity (body mass index >25): 54.7%; 4) smokers: 33.9%; 5) hypertension: 31.6% (considering >140/90mmHg) and 14.4% (considering >160/95mmHg); 6) high glycemia (>126 mg/dL): 7%; 7) high cholesterol >240 mg/dL): 5.6%.
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4	<p>Sabita S. Soedamah-Muthu, PHD, Nish Chaturvedi, MD, et al, (2004), Risk Factors for Coronary Heart Disease in Type 1 Diabetic Patients in Europe, Diabetes Care 2004 Feb; 27(2): 530-537.</p>	<p>2,329 type 1 diabetic patients</p>	<p>EURODIAB Prospective Complications Study.</p>	<ul style="list-style-type: none"> • Multivariate standardized Cox proportional hazards models showed that age (hazard ratio 1.5), AER (1.3 in men and 1.6 in women), WHR (1.3 in men), smoking (1.5 in men), fasting triglycerides (1.3 in women) or HDL cholesterol (0.74 in women), and systolic BP (1.3 in women) were predictors of CHD.
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5	Jonathan Robert Emberson, Peter H. Whincup, et al, (2005), Lifestyle and cardiovascular disease in middle-aged British men: the effect of adjusting for within-person variation, European Heart Journal (2005) 26, 1774–1782	6452 men aged 40–59	Prospective study	<ul style="list-style-type: none"> • A major CVD event within the first 20 years was observed in 1194 men (18.5%). • Use of baseline assessments of cigarette smoking and physical activity in analyses resulted in underestimation of the associations between average cumulative exposure to these factors and major CVD risk. • After correction for within-person variation, major CVD rates were over four times higher for heavy smokers (>40 cigarettes/day) compared with never smokers and three times higher for physically inactive men compared with moderately active men.
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6	<p>Stephanie E. Chiuve, ScD; Marjorie L. McCullough, RD, ScD; et al, (2006), Healthy Lifestyle Factors in the Primary Prevention of Coronary Heart Disease Among Men, doi.org/10.1161/CIRCULATIONAHA.106.62141 Circulation. 2006;114:160–167</p>	42847 men in the Health Professionals	<ul style="list-style-type: none"> • Prospective study • Self-reported questionnaires 	<ul style="list-style-type: none"> • Over 16 years, we documented 2183 incident cases of CHD (nonfatal myocardial infarction and fatal CHD). • In multivariate-adjusted Cox proportional hazards models, men who were at low risk for 5 lifestyle factors had a lower risk of CHD (relative risk: 0.13; 95% confidence interval [CI]: 0.09, 0.19) compared with men who were at low risk for no lifestyle factors. Sixty-two percent (95% CI: 49%, 74%) of coronary events in this cohort may have been prevented with better adherence to these 5 healthy lifestyle practices. • Among men taking medication for
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				<p>hypertension or hypercholesterolemia, 57% (95% CI: 32%, 79%) of all coronary events may have been prevented with a low-risk lifestyle. Compared with men who did not make lifestyle changes during follow-up, those who adopted >2 additional low-risk lifestyle factors had a 27% (95% CI: 7%, 43%) lower risk of CHD.</p>
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7	<p>Ali Khan Khuwaja, Sai ma Lalani, et al, (2011)Cardi ovascular Disease- Related Lifestyle Factors among People with Type 2 Diabetes in Pakistan: A Multicentre Study for the Prevalence, Clustering, and Associated Sociodemogr aphic Determinant s, Cardiology Research and Practice Volume 2011, Article</p>	<p>1000 patients with type 2 diabetes</p>	<ul style="list-style-type: none"> • Cross-sectional, multi- center study • Interview method 	<ul style="list-style-type: none"> • 30.3% study participants had CVD. Majority of the patients were physically inactive and had adverse psychosocial factors. • 40% of the study participants were exposed to passive smoking while 12.7% were current smokers. • Only 8.8% of study subjects had none of the studied lifestyle factor, 27.5% had one, while 63.7% had two or three factors.
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8	<p>Abdonas Tamosiunas, Dalia Luksiene, Et al, (2014)Health Factors and Risk of All-Cause, Cardiovascular, and Coronary Heart Disease Mortality: Findings from the MONICA and HAPIEE Studies in Lithuania, DOI:10.1371/journal.pone.0114283</p>	9,209 men and women aged 45–64	Population surveys	<ul style="list-style-type: none"> • Subjects with 5–6 healthy factors had hazard ratio (HR) of CVD mortality 0.35 (95% confidence interval (CI) 0.15–0.83) compared to average risk in the whole population. • The hazard ratio for CVD mortality risk was significant in men (HR 0.34, 95% CI 0.12–0.97) but not in women (HR 0.38, 95% CI 0.09–1.67).
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9	<p>T Sekhri,R S Kanwar, et al, (2014), Prevalence of risk factors for coronary artery disease in an urban Indian population, BMJ Open 2014;4:e005 346.</p>	<p>10642 men and n=1966 women; age 20–60 years</p>	<p>Quantitative study</p>	<ul style="list-style-type: none"> • The study revealed that 4.6% of the study population had a family history of premature CAD. • The overall prevalence of diabetes was 16% (5.6% diagnosed during the study and the remaining 10.4% already on medication). • Hypertension was present in 21% of subjects. • The prevalence of dyslipidemia was significantly high, with 45.6% of study subjects having a high total cholesterol/high density lipoprotein ratio. Overall, 78.6% subjects had two or more risk factors for CAD.
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10	<p>Monir Nobahar, Mohammad Reza Razavi(2015)Lifestyle and most important risk factors of cardiovascular disease in physicians, nurses and faculty members. Middle East J Rehabil Health. 2015 April; 2(2): e28882.</p>	<p>The study population comprised 19 physicians, 56 nurses and 33 faculty members.</p>	<ul style="list-style-type: none"> • Cross sectional study was conducted • Semi structured questionnaire 	<ul style="list-style-type: none"> • Totally, 108 subjects who filled in their questionnaires were included in the study. The study population, including 68.5% females, had a mean age of 36.30 ± 8.878 years. • Smokers comprised 1.8% of the subjects • Exercise more than twice a week was reported by 19.4%. • Moderate life-related and work-related stress was reported by 61.1% and 63.9% of the subjects. • The mean body mass index was 24.67 ± 3.77, and 39.8% of the participants were overweight or fat.
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11	<p>Elvin Zengin, Christoph Bicke, et al, (2015), Risk Factors of Coronary Artery Disease in Secondary Prevention—Results from the AtheroGene—Study, doi:10.1371/journal.pone.0131434</p>	<p>3229 patients with known coronary artery disease (CAD)</p>	<p>Prospective, multicenter, clinical cohort study</p>	<ul style="list-style-type: none"> • In this cohort diabetes mellitus was the risk factor with the strongest influence regarding occurrence of secondary events (hazard ratio; HR:1.70, confidence interval; CI 95%: 1.36-2.11; P<0.0001), followed by LDL/HDL ratio and smoking.
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12	<p>T. Kobayashi, M. Watanabe, et al, (2015), CLINICAL IMPACT OF TRANSITIONAL ZONE IN 12-LEAD ELECTROCARDIOGRAM ON THE RISK OF CARDIOVASCULAR DISEASES IN A POPULATION-BASED COHORT STUDY, Journal of Hypertension Volume 33, e-Supplement 1, 2015</p>	5,331 study participants	Prospective cohort study	<ul style="list-style-type: none"> • Among men, the prevalence of hypertension in the counterclockwise, normal, or clockwise rotation group was 28, 34, and 40%, respectively ($p < 0.01$). • Among women, the prevalence of hypertension in the counterclockwise, normal, or clockwise rotation group was 23, 29, and 35%, respectively ($p < 0.01$).
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13	C. James, S. Tisheva, et al, (2015), A STUDY OF RISK FACTORS FOR CORONARY ARTERY DISEASE AMONG PATIENTS WITH ISCHEMIC HEART DISEASE IN THE STATE OF KERALA IN SOUTH INDIA, Journal of Hypertension Volume 33, e-Supplement 1, 2015	643 patients	EUROASPIRE IV cohort study	<ul style="list-style-type: none"> • it was seen that in Keralites-irrespective of gender, diabetes or impaired glucose tolerance (79%) and dyslipidemia (71%) are the major risk factor for Coronary artery disease.
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14	<p>Amit V. Khera, M.D., Connor A. Et al, (2016) Genetic Risk, Adherence to a Healthy Lifestyle, and Coronary Disease, <i>The new England journal of medicine</i></p>	<ul style="list-style-type: none"> • 7814 participants in the Atherosclerosis Risk in Communities (ARIC) study, • 21,222 in the Women's Genome Health Study (WGHS) • 22,389 in the Malmö Diet and Cancer Study (MDCS) — and in 4260 participants in the cross-sectional BioImage Study 	Prospective cohorts study	Across four studies involving 55,685 participants, genetic and lifestyle factors were independently associated with susceptibility to coronary artery disease.
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3.2. Study Characteristics

The studies (n = 14), included 141096 participants. The average age ranged from 20 - 64 years. One study presented results only for women [1] while two studies presented results only for men [5,6]. In two studies participants were having type 1 and 2 diabetes [4,7]. Two studies were conducted in India [9,13] while rest of the studies conducted in other countries. Among the included articles, 1 article [1] pre-menopause women, 2 [4,7] diabetes patients and in remaining articles participants like health care workers, middle aged, patients with coronary artery diseases etc. were included to identify risk factors for CHD respectively. The included studies giving emphasise on the combination of activities like healthy diet, physical activity or exercise, weight control, smoking cessation, stress management, blood pressure and diabetes control, need of hormonal therapy after menopause and adherence to medical treatment.

4. Discussion

Making changes in lifestyle is a proven method for reducing risk of developing heart disease. While there are no guarantees that a heart-healthy lifestyle will keep heart disease away, these changes will certainly improve health in other ways, such as improving physical and emotional well-being.

Overall, the review reported there are several risk factors for heart disease; some are controllable, others are not. Uncontrollable risk factors for heart disease include being male, older age, family history of heart disease, being postmenopausal, race, etc. Still, there are many heart disease risk factors that can be controlled include smoking, high LDL, or "bad" cholesterol, and low HDL, or "good" cholesterol, uncontrolled high blood pressure, physical inactivity, obesity (having a BMI greater than 25), uncontrolled diabetes, uncontrolled stress, depression, and anger, poor diet, etc.

This review included studies from different countries. Most of these studies were conducted in developing countries, which limits the interpretation of results.

5. CONCLUSION

This systematic review results highlights very high prevalence and clustering of CVD-

related lifestyle factors, particularly healthy diet, physical activity or exercise, weight control, smoking cessation, stress management, blood pressure and diabetes control, need of hormonal therapy after menopause and adherence to medical treatment. These interventions should be based on a comprehensive and integrated approach covering all of these lifestyle factors rather than any single factor to anticipate their cumulative effects. We recommend that health care providers should provide awareness and education regarding CVD risk factors and their prevention to patients and their families/caregivers.

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