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Review Article

Preventive measures against risk factors for cardiovascular diseases in the prison environment: an integrative review

Medidas preventivas de fatores de risco de doenças cardiovasculares no ambiente prisional: revisão integrativa

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Danielle Cristina Pimentel Cabral[1]
Monique de Freitas Gonçalves Lima[1]
Nila Larisse Silva de Albuquerque[2]
Cleide Maria Pontes[1]
Tatiane Gomes Guedes[1]
Francisca Márcia Pereira Linhares[1]

[1]Universidade Federal de Pernambuco. Recife, PE, Brazil.
[2]Universidade da Integração Internacional da Lusofonia Afro-Brasileira. Redenção, CE, Brazil.

Corresponding author:
Danielle Cristina Pimentel Cabral
Rua João Rosendo, 162, Cordeiro,
CEP: 50731-065. Recife, PE, Brazil.
E-mail: danicabral10@hotmail.com

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ABSTRACT
Objective: to analyze preventive measures against risk factors for cardiovascular diseases in the prison environment. **Methods:** integrative review carried out in the databases MEDLINE/PubMed, Web of Science, SCOPUS, CINAHL, LILACS, EMBASE, and SciELO. The descriptors and keywords used, combined with the Boolean operators OR and AND were: prisons, prisoners, health promotion, health education, cardiovascular diseases, heart diseases and heart. We included articles in English, Portuguese, or Spanish, that addressed preventive measures against the risk of cardiovascular diseases in the prison environment, with no specific time frame. **Results:** the final sample included seven articles. Preventive measures found were related with exercising, nutritional improvement, weight control, smoking cessation, stress control, and laboratory follow up, focusing specially in physical activities and nutritional improvement. **Conclusion:** identifying preventive measures can aid in the development of health promotion actions for the population deprived of freedom. Nonetheless, more studies on the topic are required. **Contributions to practice:** understanding the preventive measures against risk factors for cardiovascular diseases used in the prison environment can give support to the developing of health promotion interventions.
Descriptors: Cardiovascular Diseases; Health Promotion; Prisoners; Prisons.

RESUMO
Objetivo: analisar as medidas preventivas de fatores de risco de doenças cardiovasculares no ambiente prisional. **Métodos:** revisão integrativa realizada nas bases de dados MEDLINE/PubMed, Web of Science, SCOPUS, CINAHL, LILACS, EMBASE e SciELO. Os descritores e palavras-chave utilizados, combinados com os operadores booleanos OR e AND foram *prisons, prisoners, health promotion, health education, cardiovascular diseases, heart diseases* e *heart*. Foram incluídos artigos que abordassem as medidas preventivas de fatores de risco de doenças cardiovasculares no ambiente prisional, sem recorte no tempo, nas línguas inglesa, portuguesa ou espanhola. **Resultados:** a amostra final foi composta por sete artigos. As medidas preventivas encontradas foram relacionadas a atividade física, melhora nutricional, controle do peso, cessação do tabagismo, controle do estresse e acompanhamento laboratorial, com prevalência para a atividade física e a melhora nutricional. **Conclusão:** a identificação de medidas de prevenção pode auxiliar no desenvolvimento de ações de promoção da saúde para a população privada de liberdade, entretanto, são necessários mais estudos com esta temática. **Contribuições para a prática:** conhecer as medidas preventivas de fatores de risco de doenças cardiovasculares utilizadas no ambiente prisional poderá subsidiar o desenvolvimento de intervenções para promoção da saúde.
Descritores: Doenças Cardiovasculares; Promoção da Saúde; Prisioneiros; Prisões.

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Introduction

Cardiovascular diseases are morbidities that involve the heart and the blood vessels or are associated with sequelae of insufficient vascular blood supply[1]. They are one of the main causes of death in the country, and were responsible for 27.3% of total deaths in 2017, especially in the Southeast and the North. Among cardiovascular pathologies, cardiac ischemia is one of the most prevalent, being the cause of 32.1% of deaths caused by cardiovascular disease[1-3].

Cardiovascular diseases include unmodifiable risk factors, such as age, heredity, and sex and race, and modifiable ones, that is, factors that can be changed by adhering to beneficial behaviors, such as smoking, dyslipidemia, drinking, sedentary lifestyle, depression, diabetes mellitus, arterial hypertension, and obesity[4].

In the prison environment, these risk factors are more serious, as the opportunity for change is scarce. Furthermore, unhealthy conditions, such as little ventilation, overcrowding, insufficient or contaminated water, insufficient exposure to sunlight, inadequate ingestion of residues, and food hygiene make health-promoting actions more difficult, potentially leading to stress in the incarcerated population[5].

In the United States, there are approximately 2.2 million people behind bars. In Brazil, until December 2021, there were 835,643 prisoners. Their conditions make them more susceptible to diseases than the general public[6-7]. In Brazil, diseases from the circulatory system were the cause of death of 22% of incarcerated people, the most common of them being acute myocardial infarction, cardiomyopathies, and heart failure[8]. Cardiac ischemias are very prevalent in older prisoners when compared with their younger counterparts[9].

In this population, modifiable risk factors are prevalent, including arterial hypertension, dyslipidemia, excess weight, metabolic syndrome, and diabetes[10]. Furthermore, the lack of preventive measures against cardiovascular diseases, associated with risky health-related behaviors, transform these environments in a fertile ground for the growth of cardiovascular health damage[11].

Preventive measures are actions carried out before the disease takes place. In these types of measures, intervention/action precedes the pathological process, and is based on the changing of the exposure to factors that culminate on the appearance of the disease, with the goal to reduce the number of affected persons, reducing the risk of new cases. Intervention programs to avoid cardiovascular diseases through means such as health education, physical exercise programs, and nutritional workshops, can allow changes in lifestyle. The development of these interactions, however, is limited[12-13].

This research is justified by the fact that risk factors for cardiovascular pathologies are more accentuated in the incarcerated population than otherwise, and the prison environment has several factors that can make these factors worse[11]. In this regard, the multiprofessional team must use its knowledge to implement preventive measures to reduce risk factors, promoting benefits to the cardiovascular health of the incarcerated population.

Thus, this study aimed to analyze preventive measures against risk factors for cardiovascular diseases in the prison environment.

Methods

Integrative review following the stages: knowing the phenomenon/elaborating the guiding question; search for studies; evaluation of studies included; analysis and data extraction; and synthesis of the results[14].

To formulate the question, we used the PICo acronym. In this strategy, the P stands for population (people deprived of freedom), the I stands for phenomenon of interest (preventive measures for cardiovascular diseases), and the Co refers to the context (prisons). The resulting question was: What are the preventive measures found for risk factors of cardio-

vascular diseases in the prison environment?

We carried out a literature survey in August 2022, in the databases: Medical Literature Analyses and Retrieval System Online (MEDLINE) through the National Library of Medicine National Institutes of Health (PubMed), Web of Science, SCOPUS, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Latin American and Caribbean Health Sciences Literature (LILACS), EMBASE, and Scientific Electronic Library Online (SciELO), obtained through the platform of the Coordination for the Improvement of Higher Education Personnel (CAPES).

To carry out our search, researchers selected descriptors from the controlled vocabularies Medical Subject Headings (MeSH) and health Sciences Descriptors (DeCS): prisons, prisoners, health promotion, health education, cardiovascular diseases, heart diseases, heart. Non-controlled descriptors (keywords) were considered by the researchers in order to broaden the likelihood of identifying published works. They were determined according with previous readings on the topic at hand, and included: prevention and control, multiple health behavior change, prevention programs, health-promotion environment, coronary-hearth-disease. The descriptors were associated with each other using the Boolean operators AND and OR (Figure 1).

Databases	**Search strategies used**
MEDLINE, WEB OF SCIENCE	(prisons OR prison OR prisoners OR prisoner OR jail OR correctional facilities) AND (health promotion OR health education OR prevention and control OR multiple health behavior change OR primary prevention OR prevention programs OR health-promotion environment) AND (cardiovascular diseases OR heart diseases OR heart OR coronary-heart-disease)
SCOPUS	TITLE-ABS (prisons OR prison OR prisoners OR prisoner OR jail OR "correctional facilities") AND ("health promotion" OR "health education" OR "prevention and control" OR "multiple health behavior change" OR "primary prevention" OR "prevention programs" OR "health-promotion environment") AND ("cardiovascular diseases" OR "heart diseases" OR heart OR "coronary-heart-disease")
LILACS	(prisons OR prison OR prisoners OR prisoner) AND (health promotion OR health education OR prevention and control) AND (cardiovascular diseases OR heart diseases)
CINAHL, EMBASE	(prisons OR prison OR prisoners OR prisoner OR jail OR "correctional facilities") AND ("health promotion" OR "health education" OR "prevention and control" OR "multiple health behavior change" OR "primary prevention" OR "prevention programs" OR "health-promotion environment") AND ("cardiovascular diseases" OR "heart diseases" OR heart OR "coronary-heart-disease")
SCIELO	(prisons OR prison OR prisoners OR prisoner) AND (health promotion OR health education) AND (cardiovascular diseases OR heart diseases OR heart)

Figure 1 – Article search syntax. Recife, PE, Brazil, 2022

Inclusion criteria considered articles in English, Portuguese, or Spanish, that addressed preventive measures against the risk of cardiovascular diseases in the prison environment, with no specific time frame. We excluded reflection/theoretical studies, editorials, response letters, comments, theses, dissertations, revision protocols, as well as revisions and studies that did not answer the guiding question.

All 409 studies found were incorporated into the software EndNote, to automatically remove duplicates. After duplicates were removed (78), the studies left were imported into Rayyan, software which removed further duplicate studies (32). Then, the study selection stage started through the reading of the title and the abstract. This stage was carried out independently by two authors, and disagreements between

them were solved via consensus between them. When this was not possible, a third reviewer decided on the disagreements.

After the publications were selected, reviewers carried out their readings considering inclusion criteria. Pre-eligible studies were read in full for analysis regarding their ability to contribute to the phenomenon being studied and, later, a synthesis of the results was carried out.

We created an instrument to extract the necessary information, including: authors, year of publication, language, country of origin, databases, age/study population, preventive measures against cardiovascular disease risk factors, characteristics of interventions/actions, outcomes, and levels of evidence.

The levels of evidence were classified as follows: Level I - systematic review or meta-analysis of relevant clinical trials; Level II - well-designed controlled randomize clinical trial; Level III - well-designed clinical trials with no randomization; Level IV - well-designed cohort and case-control studies; Level V - systematic review of descriptive and qualitative studies; Level VI - evidence derived from a single study, descriptive or qualitative; Level VII - opinion of authorities or report from specialist committee[15].

A descriptive analysis of the variables in the articles was carried out, and said variables were critically analyzed and discussed. The main characteristics of the selected studies and the most common preventive measures were organized in an figure.

Results

Through the selection process we found seven eligible studies to be analyzed and have their data extracted, as described in the Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA) flowchart[16] (Figure 2).

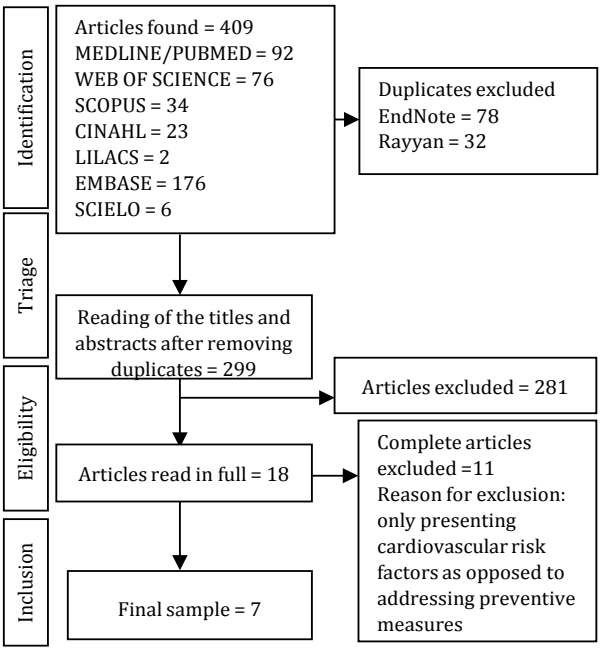

Figure 2 – Flowchart of the selection of the studies found, according to recommendations from PRISMA-ScR. Recife, PE, Brazil, 2022

We found publications from the following years: 2018[17], 2016[18-19], 2015[20], 2013[21], 2011[22] e 2008[23]. Most studies were in English[17,19-21,23], and all publications were foreign. Most studies were from the United States, with four[17,19-21], followed by Spain, with two[18,22], and Australia, with one[23].

The most common population of the studies were men, with a total of four studies[18,20-21,23], followed by women, with two[17,19], and one study which addressed both women and men[22]. The design of the researches included quasi-experimental studies[17,19], a descriptive one[18], an intervention[20], a cohort and case-control[21], a non-randomized prospective cohort[22], and a randomized study[23].

The preventive measures against cardiovascular disease risk factors in prison were: exercising[17-20,23], improving nutrition[17-19,21-22], weight and stress control, and smoking cessation[19], and laboratory follow up[22]. The most common were exercising and nutritional improvement. The interventions used to carry out the preventive measures were related to health care activities[17-20], a documentary[18], exercising programs[20,23], a nutritional workshop[21], and dietary changes[22] (Figure 3).

Author/year, language, country, database	Study design/ Level of evidence	Study population/ Age	Preventive measures for risk factors in cardiovascular diseases	Interventions	Results
Johnson et al/ 2018 English United States PUBMED[17]	Quasi-experimental III	30 women; Mean age was 42.9 years old	Physical activity and nutrition	The intervention had four components: 1) using pedometers to motivate walking; 2) using MyPlate - tool to facilitate healthy eating standards; 3) health education; and 4) monitoring the intervention and support provided by a nurse.	The exercise and the dietary intervention were effective to reduce the body mass index and improve the resilience in women prison inmates. After 6 weeks, exercise and eating habits of participants were improved.
Martínez-Delgado; Ramírez-López/2016 Spanish Spain PUBMED[18]	Descriptive study VI	33 male prisoners; The mean age in the sample was 38.2 years, from 26 to 55	Nutrition and physical activity	Four sessions. The first was an individual one to find the anthropometric measurements, and the other three were group sessions, addressing the topics of diabetes, hyperlipidemia, hypertension, basic diet principles, mediterranean diet, and exercise. In the last session, participants watched a documentary on healthy eating. As a practical activity, all prisoners collaborated in the collage of a nutritional pyramid.	Some of them reported having started a change in their lifestyles. Among the changes: eating fruit every day, eating less, or eating the food provided by the establishment, without resorting to food bought in the cafeteria, exercising more, and stopping smoking.
Nair et al/2016 English United States PUBMED[19]	Quasi-experimental III	2 groups; 120 women from 18 to 59 years old	Physical activities, weight control, smoking cessation, and stress control; Nutrition	Indoor cycling associated with health education modules about: healthy weight; routine arterial pressure for cardiovascular health and stress management; smoking cessation; nutritional education. Promotion through didactic lectures, discussions, audio/video clips, and reading material in each of the health education modules.	Allows for social support and commitment of the group, important components to promote health and change behavior that can be unavailable to women in the prison system.
Connell et al/2015 English United States EMBASE[20]	Intervention study VI	411 male interns; Mean age was 37.1 years old	Physical Activity	Physical training and health education.	Inmates who participated in 80% or more interviews improved body mass index, waist circumference, and systolic and diastolic arterial pressure.
Curd et al/2013 English United States Web of Science[21]	Cohort and case control study IV	2 groups; 56 men, 19 in the case group and 37 in the control group; Mean age was 34 years old	Nutrition	Nutrition workshop - three workshops mediated by nurses. The two first workshops were formed by four 90-minute sessions in a classroom, the third workshop were similar, but divided in five sessions. They discussed basic nutritional information, such as food groups, nutritional labels, and amount of fat and calories in foods.	Better nutritional practices and better general health state.
Gil-Delgado et al/2011 Spanish Spain PUBMED[22]	Non-randomized, prospective cohort, intervention study IV	Male and female inmates, 95 completed the program/not evaluated	Nutrition and laboratory monitoring	There were changes in diet, and quarterly and biannual anthropometric and blood biochemistry analyses.	The diet underwent changes in 86.3% of cases and significant improvements in the variables weight, body mass, fat mass, abdominal perimeter, and in the index of diastolic artery frequency.
Cashin et al/2008 English Australia PUBMED[23]	Randomized study II	20 men; Mean age of the intervention group was 48.2 years. Mean age of the control group was 53.9 years.	Physical Activity	Exercise program structured focused on cardiopulmonary resistance, as well as strength and flexibility training.	Improved cardiac frequency at rest and resistence after the program was concluded in 12 weeks.

Figure 3 – Flowchart of the selection of the studies found, according to recommendations from PRISMA-ScR. Recife, PE, Brazil, 2022

Discussion

Among the preventive measures for cardiovascular disease risk factors in the prison environment, we found: exercising programs, nutritional education, and encouragement to change behaviors, such as smoking cessation. Most studies were in English[17,19-21,23] and carried out in United States prisons[17,19-21]. This is due to the fact that the United States have the largest number of incarcerated persons in the world, equivalent to 2,068,800 people, meaning that a large portion of scientific productions are developed in the country[6]. We could not found any Brazilian studies in the databases investigated regarding preventive measures against cardiovascular diseases in prisons. However, it would be important to develop research in this topic, since, currently, Brazil has more than 800,000 people deprived of freedom[7], and cardiovascular diseases are among the five most common conditions in the prisons in the state of Rio de Janeiro[8,11].

Exercise stood out as a preventive measure. It consists in moving one's body using one's own skeletal muscles, as long as it requires effort. A physically active person is healthier and has a longer life expectation[24]. When exercise is practiced regularly, it helps maintaining weight and reduces the risk of disease, especially cardiovascular ones[25]. Our survey of these studies showed that the exercise carried out included physical training programs or walks[17,20,23]. These are low-cost, little-complexity activities, which are easy to adhere to. They can be adapted to any space of the prison environment, and do not require a gym or sports court to be practiced.

Corroborating our findings, a program to encourage walks with the aid of a pedometer was developed with people deprived of freedom, recording the number of steps and aiming to increase goals with time, making the exercise a routine activity in the group[26]. It is essential for health workers to encourage healthy habits in this population, such as walks, which is a simple activity that contributes to cardiovascular health.

Light exercises, such as walking are recommended preventive measures in prisons of a more advanced age[27]. Walking is a good option for this group, as it can be carried out within the cell, on the courtyard, or in any other space that can be adapted. The most important aspect is to make it possible to carry out some form of physical activity adequate to age group, adapted to the structure of each prison environment, that can be well accepted, in order to reduce risk factors for cardiovascular pathologies.

Exercising is important for cardiovascular control in the prison environment due to the fact that it is an efficient public health strategy that contributes to reduce the risk of cardiovascular events and improves arterial pressure[28]. Furthermore, during incarceration, when exercise is carried out regularly, it limits body weight increases and prevents obesity. Sedentary inmates gain 8.3kg, while those who exercise at least 60 minutes a day gain less weight (4.5kg)[29]. This reiterates the belief that this population must practice some form of identifiable physical activity that is in accordance with the space provided in the prison environment.

Another preventive measure recommended to be adopted by inmates is healthy nutrition. Diets have an important role in cardiovascular health. The maintenance of healthy eating habits, with no consumption of industrialized products, fried food, and excessive salt and fat has a positive effect to prevent cardiovascular diseases[30]. However, in the prison system, the daily consumption of processed foods is still a reality, including hot-dogs, sweet rolls, margarine, sodas, sweetened juice, and biscuits[31]. Certain prisons limit the types of food that visits can bring to the prisoners, using lists that mostly comprise more processed foods, such as sausages, instant noodles, and sodas[32]. This type of diet can damage the cardiovascular health of the inmate, as it has high concentrations of sodium, calories, and lipids. Nonetheless, through health edu-

cation, a nutritional improvement can be achieved, with the encouragement to change dietary standards.

For the inmates to have healthy nutrition, the studies cited interventions to promote health using pedagogical resources, such as: workshops, documentaries, and nutritional pyramid collages. Among these resources, the workshop was the most common and allowed practices of nutrition while improved health states. These educational technologies, in the form of workshops, are effective and can be made available in any prison, and adapted to their realities. The application of a workshop can have a beneficial effect and be carried out with sessions with basic nutritional information, such as food groups, nutritional labels, and fat/calorie/carbohydrate levels in food[21]. According to a research, educational programs for adult inmates, carried out using lectures, discussions, projects for gardens, and well-being bulletins with nutritional recipes had positive effects in general health, through the adoption of foods beneficial to health[33].

Strategies to promote health that allowed the involvement of individuals deprived of freedom, making them active agents in the process of constructing knowledge, enabled interaction and exchange of knowledge. This transformed the subject in the protagonist of these changes, since inmates started planning the ingestion of healthy foods, and no longer wanted the foods sold in the prison cafeteria[18]. The prison must have a nutritionist to provide a specific diet according to the context at hand and individualized guidance regarding foods and their role in the maintenance of cardiovascular health.

After all, healthy eating is paramount to preserve cardiovascular health. Foods that are beneficial to the heart should be inserted in the prison menu. Among these, we include green leafy vegetables, whose ingestion is associated to a 16% lower incidence of cardiovascular diseases, and integral grains, whose daily intake reduces in 22% the risk of cardiac disease[30].

Another preventive measure to reduce cardiovascular diseases in the prison population was the cessation of smoking. Smoking is the main cause of avoidable deaths, and an important factor susceptible to the emergence of chronic, non-transmissible pathologies. Using products derived from tobacco is harmful to one's health, causing comorbidities such as heart diseases, diabetes mellitus, cancer, pulmonary and kidney disease, and depression[34]. In the population deprived of freedom, the number of smokers is high, and can be two or three times higher than the general population, and there is less access to prevention or treatment[35].

The high rates of smoking in the prison population can be attributed, in part, to the prevalence of behavioral and mental health issues. Furthermore, smoking can be seen as a mechanisms to deal with stress in prison[36]. Therefore, it is substantially important to implement educational strategies in the struggle against smoking, as it is the main risk factor for cardiovascular diseases and the greatest risk of death among inmates[37].

One strategy to stop smoking is the combination of behavioral therapy with nicotine replacement. An group intervention lasting for 10 weeks, with one session a week, included abilities to manage humor and standard behavioral techniques associated with nicotine replacement, showing a positive effect from the fifth week on, which lasted until the end of the period in which inmates were monitored, that is, six months[19].

In accordance with the findings of this revision, a study carried out in seven prisons had a positive impact in the cessation of smoking through the use of nicotine patches. This was group intervention with one session a week for six weeks. Each session included cognitive-behavioral therapy and strategies to prevent relapses. The patches were administered to the patients by a nurse or physician of the prison system[36]. This shows that smoking cessation can be effective in the correctional environment, as long as it is carried out through interventions to promote health and the population involved is monitored by a multiprofessional team.

The preventive measures discussed, in most cases, aimed to prevent disease and promote health through education in health, which consists in the exchange of knowledge between professionals and health system users. This can be carried out using technological tools or other, simpler resources. For a positive effect, effective, clear, and easy to understand communication must take place among all those involved, allowing them to choose new behaviors in order to prevent disease and promote health[38].

In the studies found, the nurse was the main professional in the practice of health education in prison. The nurse was responsible for monitoring, every week, the counting of the steps through the pedometer, as well as the records of daily adherence to healthy eating habits using the tool MyPlate[17]. This was carried out through guidance in health education. Presenting the user with a certain resource is not enough; it is paramount to guide them on how to use said resource, for it to have a positive impact on a certain population.

Finally, most studies had positive effects as preventive measures against cardiovascular disease, considering the adherence to beneficial behavior in health for the reduction of risk behaviors. These findings can provide knowledge to nurses and other members of the multiprofessional team, to help in the development of educational programs for the adoption of preventive measures associated with cardiovascular diseases in the prison system. Brazilian studies on the topic of preventing cardiovascular diseases in the prison system must be carried out.

Study limitations

A limitation of the study is the fact that a large part of its findings reports on the reality of the United States, which has peculiarities related with the specificities of the population deprived of freedom in that country, as well as in their health and justice systems. More studies should be created addressing this topic in this public, which, probably, is still associated to a culture that is sstill stigmatized by society. Therefore, health education action adopting preventive measures against risk factors for cardiovascular diseases can aid in the reduction of gaps in the health promotion of this public. Therefore, there should be more research on this topic, since, in Brazil, there is a high number of people deprived of freedom. Another limitation is the fact that it was not possible to determine the mean age of participants in the studies, since not all studies mentioned the age of their participants, and those who did not necessarily classified age groups in the same way.

Contributions to practice

The findings of this revision contributed for the synthesis of the knowledge e a about preventive measures against cardiovascular diseases used in the prison system, giving support to the development of interventions for health promotion by the multiprofessional team.

Conclusion

Preventive measures against risk factors of cardiovascular diseases in the prison environment were related to physical activities, nutritional improvement, weight control, smoking cessation, stress control, and laboratory monitoring. The most common were physical activity and nutritional improvement. The interventions were carried out through health education activities, a documentary, programs to encourage exercising, a nutritional workshop, and dietary changes.

Identifying preventive measures can aid in the development of health promotion actions for the population deprived of freedom. Nonetheless, more studies on the topic are required.

Authors' contribution

Concept and design or analysis and data interpretation: Cabral DCP, Lima MFG.

Writing of the manuscript or relevant critical review of the intellectual content: Cabral DCP, Lima MFG, Linhares FMP.

Final approval for the version to be published and responsibility for all aspects of the text, guaranteeing the precision and integrity of any and all parts of the manuscript: Cabral DCP, Lima MFG, Albuquerque NLS, Pontes CM, Guedes TG, Linhares FMP.

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