Food Prescriptions Used to Treat Cardiometabolic Risk Factors in the US Adult Population

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ABSTRACT

Cardiometabolic syndrome is unfortunately widely prevalent in medically underserved areas with one possible non-pharmacological solution being food prescriptions from food pharmacies. Food prescriptions are defined as when a physician prescribes certain foods as treatment for health conditions. There seems to be a promising future in food prescriptions; however, there is a huge gap in the literature. Given this lack of knowledge regarding this burgeoning practice, we decided to review the current state of food prescriptions used to treat cardiometabolic conditions in US adult clinical setting. A thorough search of PubMed and GoogleScholar databases for articles written about food prescriptions' impact on cardiometabolic risk factors was conducted and explained in Methods. We analyzed the health markers, patient populations, method of food procurement, and financial incentives in food prescription programs. On average, implementation of food prescription programs decreased participants' BMI, waist circumference, blood pressure, and HbA1c. Participants in the programs were primarily African American, Hispanic, underinsured, low-income, older, and women groups. Programs with subsidies and vouchers had a higher compliance rate and food sourced from farmers markets, grocers, & mobile vendors had the best program compliance rates

INTRODUCTION

One way to address cardiometabolic syndrome in medically underserved areas is food prescriptions from food pharmacies. These healthy foods can be obtained by a voucher, for free, or out of pocket. In medically underserved areas, food prescriptions have long been floated as non-pharmacological interventions to improve risk factors for chronic illnesses. It is important to note that food prescriptions are not used alone and are often part of a comprehensive treatment plan that also includes medications, lifestyle changes, and regular medical monitoring.

With the end of Emergency SNAP and the rising costs of groceries brought about by inflation, food prescriptions are becoming an increasingly attractive treatment option. A study using a simulation model estimated that just a 30% subsidy food and vegetable incentive would prevent 1.93 million cardiovascular events, prevent 0.35 million cardiovascular deaths, and save 40 billion dollars in healthcare costs.[1] This was regardless of age, ethnicity, education, income, and participation in the SNAP program. There seems to be a promising future in food prescriptions however, there is a huge gap in the scientific literature regarding them.[2] In addition, medical providers themselves would like to use food prescriptions but there is a lack of understanding on how food prescriptions would be implemented and their health outcomes.[3]

Given this lack of knowledge regarding this burgeoning practice, we decided to review the current state of food prescriptions used to treat cardiometabolic conditions in adults in the US clinical setting. There is no one definition for cardiometabolic risk factors, however, we decided to use the most widely used criteria defined by the World Health Organization and National Cholesterol Education Program. This definition includes an increased BMI/waist circumference, insulin-resistant glucose metabolism and decreased HDL cholesterol.[4]

METHODS

Inclusion criteria

A thorough search of PubMed and GoogleScholar databases for articles written about food prescriptions' impact on cardiometabolic risk factors was conducted. Keywords used included "food prescriptions, vegetables prescription, produce prescription, fruit prescriptions, food pharmacy, food as medicine, cardiometabolic, blood pressure, glucose, insulin, cholesterol, obesity, BMI, body mass index, triglycerides, and microalbuminuria". Of the 637 articles found with associated keywords, 115 were kept after being screened by title and abstract. Finally, after a full text record screening, 22 articles were deemed eligible based on our inclusion criteria.

Exclusion Criteria

Articles or studies had to analyze the US adult population. Studies done internationally or on pediatric populations were excluded. Articles had to study the impact of food prescriptions on cardiometabolic risk factors. Articles studying the impact of food prescriptions on non-cardiometabolic related risk factors and illnesses were excluded. Articles older than 2015 were excluded to discuss up to date studies. Articles with non-food prescription interventions were excluded.

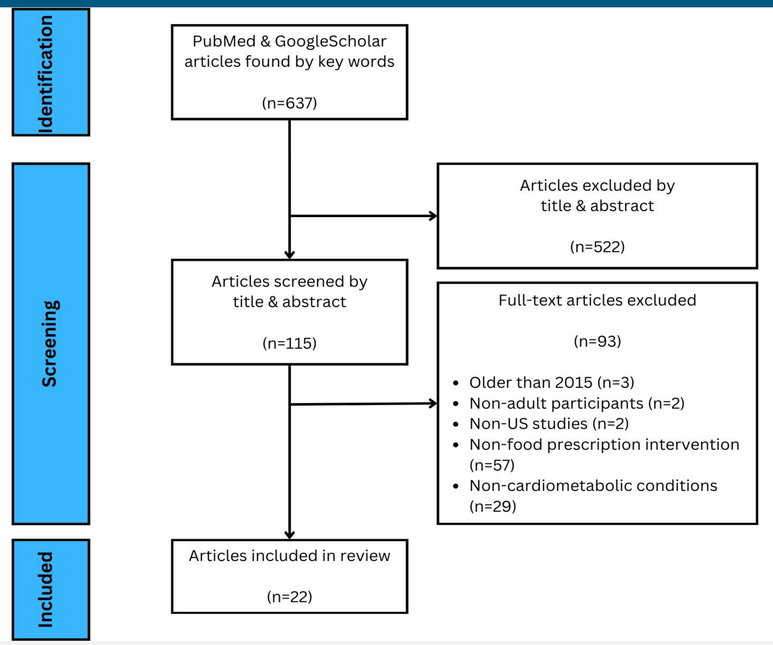

Figure 1: PRIMSA flow diagram for article selection

PRISMA: Preferred Reporting Items for Systemic Reviews and Meta-Analyses

RESULTS

Study	Design	Results
Hager et al. [6]	Cohort	↓BMI 0.52 kg/m^2 , ↓SBP 11.10 mmHg, ↓DBP 9.43 mmHg, ↓HbA1c 0.58
Bryce et al. [7]	Cohort	↓HbA1c 0.71, No significant change in weight or SBP or DBP
Emmert-Aronson et al. [8]	Cohort	↓BMI 0.10 kg/m^2,↓SBP 1.68 mmHg, No significant change in DBP
Cavaugh et al. [9]	Case Control	↓BMI 0.74 kg/m^2
Sharma et al. [10]	Cohort	↓HbA1c 0.96, No significant change in SBP or DBP or BMI
Kerr et al. [11]	Cohort	↓Waist circumference 1cm, ↓SBP 2.4 mmHg, No significant change in DBP or BMI
Racine et al. [13]	Randomized control trial	No significant change in BMI
Ranjit et al. [14]	Case Control	↓SBP 3.2 mmHg, ↓DBP 2.5 mmHg, ↓HbA1c 0.52

Table 1: Studies focusing on food pharmacies impact on cardiometabolic biomarkers

BMI: Body Mass Index, SBP: Systolic Blood Pressure, DBP: Diastolic Blood Pressure, HbA1c: glycated hemoglobin, decreased

CONCLUSIONS

According to the literature, adherence to food prescription programs decreases the BMI, blood pressure, Hb1Ac, and weight of participants. This is with the exception of Racine et al which didn't observe significant changes and the researchers believe it may have been due to the sample size coming only from the southeastern urban area of the US and not being representative of the adult population. It is important to note that this study was a randomized control trial and more randomized control trials need to be conducted on food prescription programs. However, BMI, blood pressure, HbA1c, and weight seem to be the main biomarkers being studied currently and future studies should incorporate other markers of chronic conditions. For example, a reliable indicator of cardiometabolic health is total cholesterol/HDL cholesterol and should be measured in future experiments [16]. Additionally, insulin, glucose, triglycerides, and LDL-cholesterol are all great markers of cardiometabolic health that can be measured in the future.[5]

Most of the studies regarding the impact of food prescriptions are conducted on patients coming from medically underserved areas. This makes sense as these areas lack adequate healthcare access and stand the most to gain from food prescriptions. Patient populations are typically low-income, non-White, under or uninsured, food insecure, and suffer from chronic illnesses. We also noted a majority of the participants in these studies are women over 50 years and further studies may elucidate the reason for this specific demographic being consistently the largest group in food prescription studies.

There are several barriers that prevent food prescription programs from being completely effective including but not limited to cost, transportation, health literacy, geographic access, and social support. Affordability of fruits and vegetables is a very common barrier for working class Americans and so many food pharmacy programs provide vouchers, gift cards, or cash for participants to redeem. Mobile food vendors have been created to go to underprivileged areas with a lack of transportation. Many food pharmacy programs have included health literacy courses with their food prescriptions in order to increase health and food literacy. Food prescription utilization may increase if barriers of stigma, transportation, and poor nutrition literacy are addressed.

Studies conducted on the efficacy of food pharmacies have yet to describe in detail the complex demographics of their adult participants which we laid out above for each relevant study. The meta-analysis of PubMed and GoogleScholar food pharmacy studies discussed earlier reported on the ethnic background, age, and sometimes Medicaid and SNAP enrollment of participants of the studies included in their review article. A systematic review done in 2021 regarding the strengths and limitations of food pharmacy studies described the financial status of their adult and child participants but didn't go into detail regarding other demographic information.[6] Future studies should continue to further describe the demographics of participants including but not limited to race, ethnicity, gender, sex, income, insurance status, employment status, and age. To our knowledge no studies have been conducted on Native Americans with the exception of a study done by Jones et al on Navajo children which found that the program increased the consumption of fruits & vegetables among the participants.[7] This will give researchers a better idea of who is using food pharmacies and where their placement can be the most effective. If large-scale studies consistently find significant impacts on the health outcomes of study participants then food prescriptions should be seriously considered to be integrated into the healthcare system as a viable auxiliary to medical management for cardiometabolic conditions .

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