Universidade Federal do Rio Grande Do Sul

Faculdade de Medicina

Programa De Pós-Graduação em Ciências Médicas: Endocrinologia

Área De Concentração: Metabolismo e Nutrição

Desempenho da "Teia Alimentar" como uma ferramenta para a auto-percepção da qualidade da dieta e desfechos de saúde de pacientes com alto risco cardiovascular

Tainara Aloy dos Santos

Porto Alegre

2024

Tainara Aloy dos Santos

Desempenho da “Teia Alimentar” como uma ferramenta para a auto-percepção da qualidade da dieta e desfechos de saúde de pacientes com alto risco cardiovascular

Tese apresentada como requisito parcial à obtenção do título de Doutora em Endocrinologia com ênfase em Nutrição e Metabolismo, pelo Programa de Pós-Graduação em Ciências Médicas: Endocrinologia da Faculdade de Medicina da Universidade Federal do Rio Grande do Sul.

Orientadora: Profª Drª Jussara Carnevale de Almeida

Porto Alegre

2024

CIP - Catalogação na Publicação

Aloy dos Santos, Tainara
Desempenho da "Teia Alimentar" como uma ferramenta para a auto-percepção da qualidade da dieta de pacientes com alto risco cardiovascular / Tainara Aloy dos Santos. -- 2024.
113 f.
Orientadora: Jussara Carnevale de Almeida.

Tese (Doutorado) -- Universidade Federal do Rio Grande do Sul, Faculdade de Medicina, Programa de Pós-Graduação em Ciências Médicas: Endocrinologia, Porto Alegre, BR-RS, 2024.

1. Qualidade da dieta. 2. Aconselhamento nutricional. 3. Risco cardiovascular. I. Carnevale de Almeida, Jussara, orient. II. Título.

Elaborada pelo Sistema de Geração Automática de Ficha Catalográfica da UFRGS com os dados fornecidos pelo(a) autor(a).

TAINARA ALOY DOS SANTOS

Desempenho da “Teia Alimentar” como uma ferramenta para a auto-percepção da qualidade da dieta e desfechos de saúde de pacientes com alto risco cardiovascular

Tese apresentada como requisito parcial à obtenção do título de Doutora em Endocrinologia com ênfase em Nutrição e Metabolismo, pelo Programa de Pós-Graduação em Ciências Médicas: Endocrinologia da Faculdade de Medicina da Universidade Federal do Rio Grande do Sul.

Orientadora: Profª Drª Jussara Carnevale de Almeida

Aprovada em: 13/06/2024

BANCA EXAMINADORA:

Dra. Aline Marcadenti
Hospital do Coração

Dra. Fernanda Busnello
Universidade Federal de Ciências da Saúde de Porto Alegre

Dra. Ticiana Rodrigues
Universidade Federal do Rio Grande do Sul

“Se as coisas são inatingíveis… ora!

Não é motivo para não querê-las…

Que tristes os caminhos, se não fora

A presença distante das estrelas!”

(Mario Quintana)

AGRADECIMENTOS

À minha orientadora, professora Jussara, por acreditar e confiar em mim ao longo destes 8 anos em que trabalhamos juntas. Agradeço imensamente por toda a paciência, pela sinceridade de sempre e por me desafiar a buscar o melhor. Aprendi e cresci muito ao longo dos anos.

À minha mãe e minhas irmãs, por estarem sempre ao meu lado e serem minhas grandes companheiras nesta jornada da vida. Só nós sabemos o quanto concluir mais essa etapa da minha vida acadêmica e profissional significa. Essa vitória é tão de vocês (e por vocês), quanto minha.

Ao meu amor, Rafael, por sempre acreditar que sou capaz quando eu não acredito mais nisso e por todo o incentivo e apoio nos momentos mais difíceis. Obrigada por toda paciência e amor.

À nutricionista Bárbara Riboldi, por toda ajuda, paciência e conversas que tivemos. Sem teu auxílio, este período teria sido mais árduo.

Às queridas amigas que conquistei ao longo dos anos. Obrigada por estarem comigo em diversos momentos e por tornarem tudo mais leve.

À Universidade Federal do Rio Grande do Sul, Programa de Pós-graduação em Ciências Médicas: Endocrinologia e ao Corpo Docente pela excelência em ensino, pesquisa e extensão.

À CAPES, pela concessão da bolsa de pesquisa, fundamental para que este trabalho fosse desenvolvido.

Formato da tese

Esta tese de Doutorado segue o formato proposto pelo Programa de Pós-Graduação em Ciências Médicas: Endocrinologia da Universidade Federal do Rio Grande do Sul, sendo apresentada através de uma breve revisão da literatura, seguida dos manuscritos originais referentes ao tema estudado:

CAPÍTULO I. Referencial teórico

CAPÍTULO II. Artigo original publicado no periódico *Journal of the American Nutrition Association* (Medicina I, A2, ISSN 1879-0739) redigido conforme as normas do periódico

CAPÍTULO III. Artigo original a ser submetido para publicação no periódico *British Journal of Nutrition* (Medicina I, A1, ISSN 0007-1145) redigido conforme as normas do periódico

CAPÍTULO IV. Artigo original a ser submetido para publicação no periódico *BMC Nutrition* (Medicina I, B2, ISSN 2055-0928) redigido conforme as normas do periódico

CAPÍTULO V. Considerações finais

SUMÁRIO

Lista de tabelas

Capítulo II

Capítulo III

Capítulo IV

Lista de figuras

Capítulo II

Capítulo III

Capítulo IV

Resumo

As doenças cardiovasculares são a principal causa de morte em todo o mundo, e muitas delas podem ser prevenidas através da gestão dos fatores comportamentais de risco. Dada a importância do aconselhamento nutricional para pacientes com alto risco para doenças cardiovasculares, é fundamental obter informações sobre os padrões alimentares dessa população. Avaliar a qualidade da dieta pode, portanto, auxiliar no desenvolvimento de estratégias eficazes de prevenção e controle de doenças. O aprimoramento das ferramentas de coleta de informações é essencial para estabelecer associações precisas entre dieta e saúde. Pensando nisso, a "Roda da Vida", que é uma ferramenta utilizada em processos de *Coaching*, foi adaptada para uma "Teia Alimentar" com o intuito de ser uma ferramenta útil para trabalhar o aconselhamento nutricional dos pacientes. Foi observada associação positiva entre o consumo adequado pelo autorrelato dos pacientes e a avaliação do nutricionista em quase todos os seus componentes, sugerindo que possa ser uma ferramenta interessante para a ampliação da consciência alimentar do indivíduo. Entretanto, pelo fato desta ser uma ferramenta nova, seu desempenho deve ser amplamente testado. Desta forma, o objetivo desta tese foi conhecer o desempenho da "Teia Alimentar" em avaliar a qualidade da dieta de pacientes com alto risco cardiovascular. Nossos achados mostram que aderir à Teia Alimentar (incremento de pelo menos 10% na autopercepção da qualidade da dieta), aumenta a probabilidade de reduzir pelo menos 3% do peso em seis meses. A Teia Alimentar parece potencializar a conscientização ao fornecer dados sobre a qualidade da dieta e colocar o paciente como protagonista, facilitando a autoavaliação e autoconsciência do comportamento alimentar. Acreditamos que esta maior consciência pode ser sustentada a longo prazo, uma vez que a Teia Alimentar envolve ativamente o paciente, aproveitando o seu conhecimento nutricional prévio como ponto de partida.

Palavras- chave: aconselhamento nutricional; qualidade da dieta; risco cardiovascular

Abstract

Cardiovascular diseases are the leading cause of death worldwide, and many of them can be prevented by managing behavioral risk factors. Given the importance of nutritional counseling for patients with cardiovascular diseases, it is essential to obtain information about the dietary patterns of this population. Assessing diet quality can, therefore, assist in the development of effective disease prevention and control strategies. Improving information collection tools is essential to establish accurate associations between diet and health. With this in mind, the "Wheel of Life", which is a tool used in Coaching processes, was adapted into a "Wheel of Cardiovascular Health Diet" with the aim of being a useful tool for providing nutritional advice to patients. A positive association was observed between adequate consumption according to patients' self-perception and the nutritionist's assessment of almost all of its components, suggesting that it could be an interesting tool for increasing an individual's dietary awareness. However, because this is a new tool, its performance must be extensively tested. Therefore, the objective of this thesis was to understand the performance of the "Wheel of Cardiovascular Health Diet" in evaluating the quality of the diet of patients at high cardiovascular risk. Our findings show that adhering to the "Wheel of Cardiovascular Health Diet" (increase of at least 10% in self-perception of diet quality) increases the probability of reducing at least 3% of weight in six months. The "Wheel of Cardiovascular Health Diet" appears to enhance awareness by providing data on the quality of the diet and placing the patient as the protagonist, facilitating self-assessment and self-awareness of eating behavior. We believe that this greater awareness can be sustained in the long term, since the "Wheel of Cardiovascular Health Diet" actively involves the patient, taking advantage of their previous nutritional knowledge as a starting point.

Keywords: nutritional counseling; diet quality; cardiovascular risk

Capítulo I

Referencial teórico

Doenças cardiovasculares

As doenças cardiovasculares (DCV) são um grupo de doenças do coração e dos vasos sanguíneos e são a principal causa de morte no mundo. Em 2019, as DCV foram responsáveis por 17,9 milhões de mortes, representando 31% de todas as mortes em nível global. Destes óbitos, estima-se que 85% ocorrem devido a ataques cardíacos e acidentes vasculares cerebrais (AVCs) (1).

Quanto aos fatores de risco para ocorrência das DCV, alguns deles não são modificáveis (idade, sexo, herança genética), outros são modificáveis, ou seja, podem ser melhorados (tabagismo, sedentarismo, maus hábitos alimentares, pressão arterial elevada, diabetes tipo 2, dislipidemia, obesidade) (2).

Os principais comportamentos que aumentam o risco, tanto para doenças cardíacas quanto para AVCs, são o uso de tabaco, hábitos alimentares não saudáveis, obesidade, falta de atividade física e uso nocivo do álcool. Os efeitos dos fatores comportamentais de risco podem se manifestar em indivíduos por meio de glicemia alta, pressão arterial elevada, hiperlipidemia, excesso de peso, os quais indicam um maior risco de desenvolvimento de ataques cardíacos, acidentes vasculares cerebrais, insuficiência cardíaca e outras complicações (1).

Ainda, é preciso considerar que a existência de múltiplos fatores de risco aumenta progressivamente o risco de DCV e de ataques cardíacos (3). Desta forma, recomenda-se que seja calculado a estimativa de risco de DCV do indivíduo, ou seja, a sua probabilidade de desenvolver um evento cardiovascular fatal durante um determinado período de tempo, para a elaboração de estratégias individualizadas (3).

Para ajudar a diagnosticar e monitorizar indivíduos com risco aumentado de desenvolver DCV, foram desenvolvidos modelos de calculadoras de risco, como o *SCORE - Systematic Coronary Risk Evaluation* (4), utilizado na Europa, o *ASCVD risk - Atherosclerotic Cardiovascular Disease* (5), utilizado nos Estados Unidos, e o *HEARTS*

calculator (6), utilizado nas Américas. O *HEARTS calculator* estima o risco potencial de infarto do miocárdio, acidente vascular cerebral ou morte cardiovascular em 10 anos. É uma adaptação regional da *Global Hearts Initiative* da Organização Mundial da Saúde e será implementado nas seis regiões das Américas (Andina, Caribe, Central, Norte, Sul e Tropical) até 2025 (6).

Em 2010, a *American Heart Association* (AHA) propôs as "Metas de Impacto Estratégico" com o objetivo de diminuir as doenças cardiovasculares, as taxas de mortalidade e melhorar a saúde cardiovascular nos Estados Unidos até 2020. Para atingir esses objetivos e avaliar e monitorar a saúde cardiovascular da população, eles desenvolveram o conceito de "Saúde Cardiovascular Ideal", que é um escore com fatores de estilo de vida e saúde (7). A *American College of Cardiology* (ACC) e a AHA publicaram uma diretriz sobre a prevenção primária de doenças cardiovasculares. Eles trazem as principais mensagens para a prevenção dessas doenças, as quais pode-se destacar a promoção de um estilo de vida saudável ao longo da vida; a abordagem de cuidados em equipe; o consumo de uma dieta saudável que enfatize a ingestão de vegetais, frutas, nozes, grãos integrais, proteína vegetal ou animal magra e peixe e minimize a ingestão de ácidos graxos do tipo trans-insaturados, carne vermelha e processadas, carboidratos refinados e bebidas açucaradas; o aconselhamento e restrição calórica para adultos com excesso de peso, para alcançar e manter a perda de peso; e a prática de pelo menos 150 minutos por semana de atividade física de intensidade moderada ou 75 minutos por semana de atividade física de intensidade vigorosa (8).

Aconselhamento nutricional

O aconselhamento nutricional é uma modalidade de intervenção voltada para a educação alimentar e nutricional, realizada de forma individual ou em grupo. Envolve

encontros frequentes com o nutricionista e progride gradualmente através de todas as etapas do processo até alcançar o resultado desejado. Para conduzir de forma efetiva as mudanças necessárias nos pacientes, o nutricionista deve possuir atributos como apoio ao cliente, habilidade de diálogo, compreensão, capacidade de observação e conhecimento técnico. O aconselhamento nutricional é relevante e visa ajudar os pacientes a mudar o seu comportamento alimentar da melhor forma possível. O processo de aconselhamento ocorre em fases que, juntas, levam ao objetivo final da mudança. Embora essas etapas sejam comuns a todos os pacientes, elas acontecem de forma diferente para cada indivíduo (9).

As etapas do aconselhamento são divididas em três processos progressivos: Descoberta Inicial, Exploração em Profundidade e Preparação para Ação (9).

A fase de Descoberta Inicial é caracterizada pela formação de vínculo entre o profissional e o cliente. O conselheiro deve estar atento às palavras e ações do cliente, demonstrando interesse através de postura, expressões faciais e contato visual. Para o nutricionista, é essencial praticar a escuta ativa, sabendo ouvir e aceitar o paciente, criando um ambiente propício para a próxima etapa (9).

Na fase de Exploração em Profundidade, o paciente é incentivado a explorar seus pensamentos e sentimentos sobre a mudança, aprofundando-se nos problemas e visualizando soluções. O nutricionista deve encorajar o paciente a fazer suas próprias escolhas, identificar suas necessidades, compartilhar técnicas de resolução de problemas, comunicar diagnósticos e envolver o paciente em um processo de autodiagnóstico (9). Diversas técnicas, como perguntas fechadas e abertas, uso de diretivas, estímulos e escuta ativa, podem ser utilizadas para facilitar a abordagem (9). A confiança estabelecida na fase inicial é crucial para esse processo.

Na última etapa, de Preparação para Ação, o paciente deve consolidar todos os conhecimentos adquiridos, testar planos e desenvolver ações para resolver os problemas. O nutricionista deve apoiar o paciente na busca por novos planos e encorajá-lo a sustentar essas

novas mudanças. Quando essas mudanças se tornarem consistentes na vida do paciente e forem validadas através de encontros com o nutricionista, o aconselhamento é considerado concluído (9).

Considerando a relevância do aconselhamento nutricional para pacientes com doenças crônicas, a obtenção de informações quanto aos padrões alimentares nesta população torna-se importantes porque permitem identificar alimentos ou grupos alimentares que podem contribuir para a carga da doença atual. A epidemiologia nutricional tem se dedicado ao estudo dos efeitos de nutrientes específicos sobre os desfechos em saúde e identifica os padrões alimentares através de duas formas: *a priori* ou *a posteriori*. Na definição de padrões "a priori" são propostos índices que permitem avaliar a qualidade da dieta baseada em conceitos de nutrição saudável e recomendações nutricionais (10; 11).

Nesse sentido, o Heathy *Eating Index* (HEI), tem sido um dos principais instrumentos utilizados em pesquisas que objetivaram avaliar a qualidade da dieta de diversas populações. O instrumento foi elaborado pelo Departamento de Agricultura dos Estados Unidos, com o intuito de avaliar a qualidade da dieta da população saudável norte-americana de acordo com as recomendações nutricionais. A última atualização da ferramenta foi realizada em 2020 (12). O *Heathy Eating Index* engloba 13 componentes: nove componentes de adequação ("total de frutas", incluindo sucos de frutas 100% naturais; "frutas inteiras", excluindo sucos e extratos; "total de vegetais"; "verduras e feijões"; "grãos integrais"; "alimentos proteicos totais"; "frutos do mar e proteínas vegetais"; "açúcares adicionados" e "gorduras saturadas"). Cada componente normalmente recebe uma pontuação máxima de 10 pontos; para componentes divididos em dois (ex. Frutas Totais e Frutas Inteiras), cada subcomponente recebe cinco pontos. Ao final, a pontuação total do *Heathy Eating Index* varia de zero a 100. Mais recentemente, Cacau e colaboradores (13) desenvolveram e validaram um índice baseado nas Metas Dietéticas da AHA e o escore de dieta saudável para definição de saúde cardiovascular. O *Cardiovascular Health Diet Index* foi baseado nessas

recomendações, com algumas adaptações para se adequar à cultura alimentar brasileira, e inclusão dos componentes baseados em evidências científicas quanto à proteção (produtos lácteos) ou risco (carne vermelha e alimentos ultraprocessados) de doença cardiovascular e outros desfechos, como DM2.

Porém, para conhecer a qualidade da dieta do indivíduo a partir destes índices, é preciso aplicar algum instrumento que avalie o consumo alimentar, tais como o Questionário de Frequência Alimentar, Recordatório Alimentar ou Registro Dietético (14). Ainda, a transformação da informação dos inquéritos alimentares para uma posterior interpretação da qualidade da dieta é comumente feita por um nutricionista ou estudante de nutrição previamente treinado e acabam omitindo a participação do paciente neste processo.

Considerando o pressuposto de que o paciente deve estar no centro do cuidado e das decisões relacionadas ao processo de mudança de estilo de vida (15), existe uma modalidade profissional denominada de *Coach*, que auxilia o indivíduo a atingir um objetivo, seja na vida pessoal ou profissional, a partir de treinamento e orientação e que dentro da sua metodologia, proporciona consciência e autoconhecimento. Esta temática é baseada na ideia de que há vários aspectos que o indivíduo desconhece em si mesmo e que só é capaz de reconhecer com a aquisição de novas competências obtidas durante o processo de *Coaching* (16). O *coaching* está sendo cada vez mais reconhecido como um dos métodos de desenvolvimento pessoal mais satisfatórios e eficientes para alcançar objetivos pessoais e/ou profissionais e aplica-se a cada vez a um número mais diversificado de áreas profissionais. Uma das etapas da metodologia do *Coaching* é a identificação da situação atual do cliente e, para isso, existem algumas ferramentas utilizadas durante o processo, entre elas, a “Roda da Vida”. Este instrumento tem a forma de um círculo e é dividido em fatias onde cada uma representa a satisfação que o cliente sente em determinada área da vida e, em cada fatia, há uma escala numeral, simbolizando o quão satisfeito o cliente está naquela área (16).

Este instrumento poderia ser utilizado na educação alimentar, uma vez que coloca o paciente/cliente como principal ator no processo a partir do autoconhecimento do seu comportamento alimentar. Pensando nisso, a "Roda da Vida" foi adaptada para uma "Teia Alimentar" (Figura 1) pelo nosso grupo de pesquisa e colaboradores com o intuito de ter uma ferramenta para trabalhar o aconselhamento nutricional dos pacientes. A Teia Alimentar é composta por onze grupos alimentares: carne vermelha, peixes, sementes/nozes, frutas, verduras e legumes, ultraprocessados, laticínios, embutidos, leguminosas, grãos integrais e bebidas açucaradas. Para cada grupo há indicação de quantidade e frequência recomendada de consumo, baseado nas recomendações nutricionais do Cardiovascular Health Diet Index (13). A seguinte pergunta é feita ao paciente: "Você já refletiu sobre a sua alimentação? Assinale na teia qual "nota" você daria para cada hábito destacado." Então, o paciente, a partir da própria percepção, pode atribuir: "excelente" quando consome constantemente a porção recomendada; "muito bom" ou "bom" quando consome frequentemente a porção recomendada; "ruim" quando raramente consome a porção recomendada; e "péssimo" quando está longe de consumir a porção recomendada.

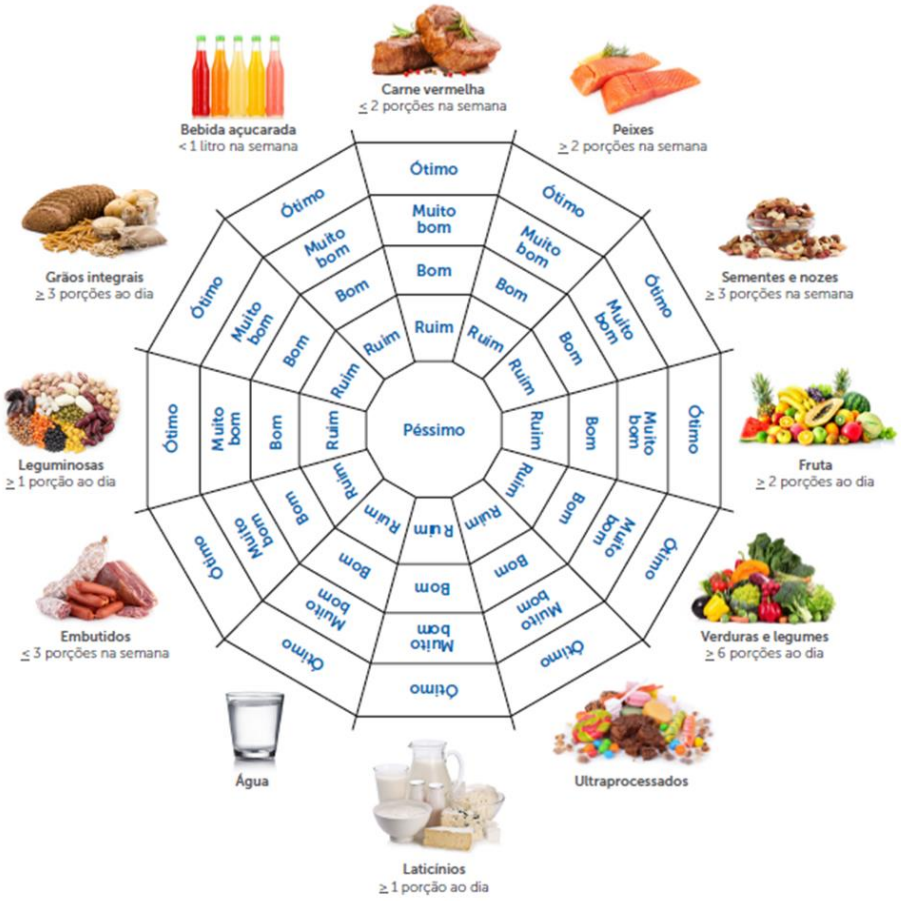

Figura 1. Teia Alimentar

Recentemente foi observada associação positiva entre o consumo adequado pelo autorrelato dos pacientes e a avaliação do nutricionista em quase todos os componentes da Teia Alimentar, sugerindo que possa ser uma ferramenta interessante para a ampliação da consciência alimentar por parte do indivíduo a partir da autopercepção da qualidade da sua dieta [17]. No entanto, esta é uma ferramenta nova e seu desempenho deve ser amplamente testado.

Os sistemas de saúde e os países precisam se concentrar em fornecer intervenções eficazes previnem e controlam o Diabetes Mellitus (DM) e a Hipertensão (HAS), além das que diminuem a obesidade e o colesterol alto, melhoram a qualidade da dieta e a atividade física, reduzem o uso excessivo de tabaco e álcool (18). O Ministério da Saúde vem adotando estratégias e ações a fim de investir na prevenção dessas doenças, não só pela qualidade de

vida dos indivíduos como também para evitar hospitalizações e consequentemente, os gastos. Um exemplo, é o Programa Nacional de Atenção à Hipertensão Arterial e Diabetes Mellitus (Programa HIPERDIA), que foi constituído em 2001 com a criação do Plano de Reorganização da Atenção à Hipertensão Arterial e Diabetes Mellitus com o objetivo de estabelecer a organização da assistência, prevenir e promover a saúde, com a vinculação dos usuários à rede, a implementação de programa de educação permanente em hipertensão, diabetes e demais fatores de risco para doenças cardiovasculares (19).

Além disso, em 2009 foi criado o Programa de Apoio ao Desenvolvimento Institucional do Sistema Único de Saúde (PROADI-SUS) que é uma aliança entre seis hospitais de referência no Brasil e o Ministério da Saúde. O propósito desse programa é apoiar e aprimorar o SUS por meio de projetos de capacitação de recursos humanos, pesquisa, avaliação e incorporação de tecnologias, gestão e assistência especializada demandados pelo Ministério da Saúde. Nesse sentido, foram desenvolvidos os ensaios clínicos "Efetividade de uma estratégia Nutricional para controle GLICêmico em participantes com diabetes mellitus tipo 2 usuários do Sistema Único de Saúde (SUS): estudo NUGLIC" e "Efetividade de uma estratégia NUtricional para controle PRESSórico em participantes com hipertensão arterial sistêmica usuários do Sistema Único de Saúde (SUS): estudo NUPRESS", que têm como objetivo avaliar a efetividade de uma estratégia nutricional para o controle glicêmico e pressórico em pacientes com DM2 e/ou HAS usuários do SUS a fim de minimizar os gastos do sistema público de saúde (20).

Ambos são randomizados, abertos e multicêntricos. Os pacientes alocados para o grupo controle receberam prescrição dietética individualizada de acordo com o recomendado pelas diretrizes. O aconselhamento nutricional no grupo intervenção foi realizado com base na qualidade da dieta, no Guia Alimentar para a População Brasileira, em conceitos de terapia comportamental e mindfulness, nos alvos metabólicos a serem atingidos e em um estilo de vida saudável. Toda a orientação dietética foi baseada em metas factíveis

construídas em conjunto (paciente e nutricionista). Os participantes foram acompanhados por um período de seis meses. Ambos os ensaios clínicos tiveram seu início em 2019, e terminaram em 2021, ou seja uma parte ocorreu durante a pandemia COVID-19.

Justificativa e hipótese de pesquisa

A associação entre componentes na dieta e o desenvolvimento de enfermidades tem sido cada vez mais estabelecida em estudos epidemiológicos. A avaliação da qualidade alimentar pode contribuir para o planejamento de estratégias de prevenção e controle de doenças. Portanto, o aperfeiçoamento das ferramentas de coleta de informações é crucial para a determinação de associações precisas entre dieta e saúde-enfermidade (21).

O *Heathy Eating Index* (HEI), instrumento mais amplamente utilizado, validado e que apresenta um bom desempenho, exige que o preenchimento seja realizado pelo nutricionista a partir dos dados obtidos no inquérito alimentar (22; 23). Sendo assim, o instrumento inviabiliza que o paciente identifique, através da própria percepção, seu padrão alimentar. A "Roda da Vida" (24), utilizada em processos de *Coaching*, é um instrumento que permite uma autoavaliação da situação pessoal e/ou profissional nos itens dispostos. Então, a "Roda da Vida" foi adaptada para uma "Teia Alimentar" com o objetivo de trabalhar o aconselhamento nutricional dos pacientes. Foi observada associação positiva entre o consumo adequado pelo autorrelato dos pacientes e a avaliação do nutricionista em quase todos os seus componentes, sugerindo que possa ser uma ferramenta interessante para a ampliação da consciência alimentar do indivíduo (17). Entretanto, pelo fato desta ser uma ferramenta nova, seu desempenho deve ser testado.

Desta forma, o intuito do presente trabalho é continuar aprofundando o estudo de avaliação de desempenho da Teia Alimentar, afinal, o instrumento pode ser preenchido pelo próprio paciente durante consulta com auxílio do nutricionista, permite a visualização (a partir

de imagens) dos grupos alimentares e possivelmente promove a reflexão do indivíduo acerca dos seus hábitos dietéticos (autoconhecimento do comportamento alimentar).

Objetivos

Objetivo geral

Conhecer o desempenho da "Teia Alimentar" em avaliar a qualidade da dieta e desfechos de saúde de pacientes com alto risco cardiovascular.

Objetivos específicos

- Comparar o desempenho da "Teia Alimentar" em avaliar a qualidade da dieta quando comparada ao *Heathy Eating Index* (padrão de referência relativo).
- Avaliar a possível associação entre a melhora da qualidade da dieta avaliada a partir da teia alimentar com parâmetros metabólicos e obtenção de alvos terapêuticos (peso corporal, controle glicêmico, valores pressóricos e perfil lipídico).
- Avaliar a possível associação entre a qualidade da dieta avaliada a partir do Heathy Eating Index com os alvos terapêuticos (peso corporal, controle glicêmico, valores pressóricos e perfil lipídico)

Referências

1. World Health Organization. Cardiovascular Diseases [Internet]. 2021 June 11. Disponível em: https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds). Acesso em: mai. 2024.

2. Ciumărnean L, Milaciu MV, Negrean V, Orășan OH, Vesa SC, Sălăgean O, Iluţ S, Vlaicu SI. Cardiovascular Risk Factors and Physical Activity for the Prevention of Cardiovascular Diseases in the Elderly. Int J Environ Res Public Health. 2021 Dec 25;19(1):207. doi: 10.3390/ijerph19010207. PMID: 35010467

3. Francula-Zaninovic S, Nola IA. Management of Measurable Variable Cardiovascular Disease' Risk Factors. Curr Cardiol Rev. 2018;14(3):153-163. doi: 10.2174/1573403X14666180222102312.

4. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, Cooney MT, Corrà U, Cosyns B, Deaton C, Graham I, Hall MS, Hobbs FDR, Løchen ML, Löllgen H, Marques-Vidal P, Perk J, Prescott E, Redon J, Richter DJ, Sattar N, Smulders Y, Tiberi M, van der Worp HB, van Dis I, Verschuren WMM, Binno S; ESC Scientific Document Group. 2016 European Guidelines on cardiovascular disease prevention in clinical practice: The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts)Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). Eur Heart J. 2016 Aug 1;37(29):2315-2381. doi: 10.1093/eurheartj/ehw106.

5. Wong ND, Budoff MJ, Ferdinand K, Graham IM, Michos ED, Reddy T, Shapiro MD, Toth PP. Atherosclerotic cardiovascular disease risk assessment: An American Society for

Preventive Cardiology clinical practice statement. Am J Prev Cardiol. 2022 Mar 15;10:100335. doi: 10.1016/j.ajpc.2022.100335.

6. Ordunez P, Tajer C, Gaziano T, Rodriguez YA, Rosende A, Jaffe MG. The HEARTS app: a clinical tool for cardiovascular risk and hypertension management in primary health care. Rev Panam Salud Publica. 2022 Mar 28;46:e12. doi: 10.26633/RPSP.2022.12.

7. Lloyd-Jones D, Adams RJ, Brown TM, Carnethon M, Dai S, De Simone G, Ferguson TB, Ford E, Furie K, Gillespie C, Go A, Greenlund K, Haase N, Hailpern S, Ho PM, Howard V, Kissela B, Kittner S, Lackland D, Lisabeth L, Marelli A, McDermott MM, Meigs J, Mozaffarian D, Mussolino M, Nichol G, Roger VL, Rosamond W, Sacco R, Sorlie P, Stafford R, Thom T, Wasserthiel-Smoller S, Wong ND, Wylie-Rosett J; American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Executive summary: heart disease and stroke statistics--2010 update: a report from the American Heart Association. Circulation. 2010 Feb 23;121(7):948-54. doi: 10.1161/CIRCULATIONAHA.109.192666.

8. Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation. 2019 Sep 10;140(11):e596-e646.
Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases Writing Group. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. J Am Coll Cardiol. 2020 Dec 22;76(25):2982-3021.

9. Feoli AMP, Fitz RC, Zimmer S, Lang TSS, Wulff TS. Aconselhamento nutricional nas doenças crônicas não transmissíveis: técnicas da entrevista motivacional [Internet]. Porto Alegre: EDIPUCRS; 2014. Disponível em: http://www.pucrs.br/edipucrs. Acesso em: mai. 2024.

10. Hu, FB. Dietary pattern analysis: a new direction in nutritional epidemiology. Curr Opin Lipidol. 2002; (13):3-9.

11. Kac G, Sichieri R, Gigante DP. Introdução à Epidemiologia nutricional. In Epidemiologia Nutricional. Ed Fiocruz/Atheneu, 2007, p. 213-225.

12. Shams-White MM, Pannucci TE, Lerman JL, Herrick KA, Zimmer M, Meyers Mathieu K, Stoody EE, Reedy J. Healthy Eating Index-2020: review and Update Process to Reflect the Dietary Guidelines for Americans 2020-2025. J Acad Nutr Diet. 2023;123(9):1280–8.

13. Cacau LT, Marcadenti A, Bersch-Ferreira AC, Weber B, de Almeida JC, Rodrigues CCR, Lotufo PA, Bensenor IM, Marchioni DM. The AHA Recommendations for a Healthy Diet and Ultra-Processed Foods: Building a New Diet Quality Index. Front Nutr. 2022 Apr 11;9:804121. doi: 10.3389/fnut.2022.804121.

14. Silva ADSD, Brito FDSB, Santos DMD, Adegboye ARA. Use of Digital Tools for the Assessment of Food Consumption in Brazil: A Scoping Review. Nutrients. 2024 May 6;16(9):1399. doi: 10.3390/nu16091399.

15.American Diabetes Association (ADA). Standards of Medical Care in Diabetes, 2024; 42 (Suppl. 1).

16. Byrne U. Wheel of Life: Effective steps for stress management. Business Information Review. 2005. 22(2): 123–130.

17. Chites VS. Avaliação da qualidade da dieta a partir da teia alimentar : desempenho da autopercepção do paciente em comparação com a avaliação da nutricionista. Universidade Federal do Rio Grande do Sul. Faculdade de Medicina. Programa de Pós-Graduação em Ciências Médicas: Endocrinologia. Porto Alegre, 2022.

18. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, et al. Global Burden of Cardiovascular Diseases Writing Group. Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019

Study. J Am Coll Cardiol. 2020 Dec 22;76(25):2982-3021.

19. Cadernos de Atenção Básica: 7. Hipertensão arterial sistêmica (HAS) e Diabetes mellitus (DM): protocolo / Departamento de Atenção Básica. – Brasília: Ministério da Saúde, 2001.

20. Programa de Apoio ao Desenvolvimento Institucional do Sistema Único de Saúde. Brasília: Ministério da Saúde, 2022. Disponível em: https://hospitais.proadi-sus.org.br/

21. Kac G, Sichieri R, Gigante DP. Introdução à Epidemiologia nutricional. In Epidemiologia Nutricional. Ed Fiocruz/Atheneu, 2007, p. 213-225.

22. Antonio JP et al. Development of a Healthy Eating Index for patients with type 2 diabetes. Rev. Nutr., Campinas, Rev. Nutr., Campinas, 28(5):513-522, set./out., 2015, 28(5):513-522.

23. Reedy, J. et al. Evaluation of the Healthy Eating Index-2015. Journal of the academy of nutrition and dietetics, 2018. V. 118 (9).

24. Lages A., O'Connor, J. (2005). Coaching con Pnl. Guía prática para obtener lo mejor de ti miesmi y de los demás. Barcelona.

Capítulo II

Artigo original publicado no periódico *Journal of the American Nutrition Association*

redigido conforme as normas do periódico

Could the Wheel of Cardiovascular Health Diet be a tool for diet quality in nutritional counseling? Comparison with Healthy Eating Index-2020

DOI: 10.1080/27697061.2023.2297888

Tainara Aloy dos Santos, MsC, RD

Jussara Carnevale de Almeida, PhD, RD

Abstract

Objective: The Wheel of Cardiovascular Health Diet was recently elaborated based on current nutritional recommendations for healthy eating and was made for person-centered nutritional counseling, thus it may be an interesting tool to improve food awareness. However, its validity is yet to be tested. We hypothesized that the self-perception of patients diagnosed with chronic diseases, evaluated by the Wheel of Cardiovascular Health Diet, is satisfactory in assessing the quality of their diets, compared with the Healthy Eating Index-2020.

Methods: This is a cross-sectional analysis of adults with uncontrolled hypertension or type 2 diabetes. The patients answered the Wheel of Cardiovascular Health Diet, and then, based on the food frequency questionnaire, we analyzed the Healthy Eating Index-2020.

Results: A total of 330 patients were included in the study: 91.5% had hypertension, 58.5% had type 2 diabetes, and the median age was 58 (50-65) years. The mean difference observed between the percentage of the graphic area assessed by the patients' self-perception from the Wheel of Cardiovascular Health Diet and Healthy Eating Index-2020 was −10.0% (95%CI −35.3 to 15.3), and a moderate correlation was observed. Linear Regression models showed that a 10-point increase in patients' self-perception in the Wheel of Cardiovascular Health Diet is associated with a 2.9% increase (95%CI 2.08 to 3.70) in the diet quality by the Healthy

Eating Index-2020 and is associated with lower BMI values: β = −0.42kg/m² (95%CI −0.83 to −0.01).

Conclusion: The Wheel of Cardiovascular Health Diet performed satisfactorily regarding validity and reliability by BMI and was associated with higher overall dietary quality, with the Healthy Eating Index-2020 as a relative reference.

Keywords: Diet Quality; Diabetes Mellitus, Type 2; Hypertension; Self Care

Introduction

Cardiovascular diseases are heart and circulatory system disorders. Their prevalence and mortality cases worldwide, within a 1-year period, have been 422.7 million and 17.9 million, respectively [1,2]. Hypertension and type 2 diabetes (T2DM) are major risk factors for the development of cardiovascular diseases [3]. Current recommendations for preventing cardiovascular diseases are the cessation of tobacco use, regular physical activity, reduction of salt intake, avoiding harmful use of alcohol, and eating more fruits and vegetables [1]. Nutritional counseling is relevant and aims to help patients change their eating behavior in the best possible way. The counseling process takes place in phases that, together, lead to the final objective of the change. Although these steps are common to all patients, they happen differently for each individual [3]. International Guidelines [3,5] have numerous methods to reduce cardiovascular disease risk profiles with strong consensus regarding lifestyle behavior [6]. Primary prevention is an important priority for all health policy makers and it should be person-centered as this type of care respects and is responsive to individual preferences, needs, and values. It ensures that the person's priorities guide all decision-making [7].

Thus, dietary indexes have been recommended to monitor adherence to nutritional recommendations among individuals and populations [1]. Several instruments are available to evaluate diet quality, among which the Healthy Eating Index-2020 [9,10] stands out, since it

considers the consumption of food groups and specific nutrients [11]. However, these instruments have a limitation: they are only used and interpreted by the nutritionist or health professional, and no instrument is planned for the patient [12]. In this regard, a tool used in coaching processes called “Wheel of Life” allows for a self-assessment of the personal or professional situation [13].

Recently, our group adapted a “Wheel of Life” to a “Wheel of Cardiovascular Health Diet” [14] aiming to work on nutritional counseling for patients and increase their awareness on their diet. The Wheel of Cardiovascular Health Diet may be an interesting tool to increase patients’ awareness of their diet in nutritional counseling [14]. However, its performance as an instrument for diet quality self-assessment needs to be tested. This work is the second of a series of manuscripts that aims to evaluate the performance of a new tool for patient’s self-perception about their diet quality. This is a tool that may help in nutritional counseling for patients, since it provides data on diet quality and places the patient at the center of care. In fact, a positive association was observed between adequate consumption from patients’ self-report and the nutritionist’s assessment in almost all components of the Wheel of Cardiovascular Health Diet [14], suggesting that it may be an interesting tool to improve food awareness. In this context, this article proposes to evaluate the concurrent validity of the Wheel of Cardiovascular Health Diet to assess diet quality, using the Healthy Eating Index-2020 as a reference standard. The hypothesis of this study is that the self-perception of patients diagnosed with T2DM and/or hypertension, evaluated by the Wheel of Cardiovascular Health Diet, can perform satisfactorily in assessing the quality of their diets, measured by the Healthy Eating Index-2020 (relative reference) and, therefore, can be used in patient-centered strategies for behavior change.

Materials and Methods

Study population

This is a cross-sectional study that analyzes the baseline data from the "Effectiveness of a Nutritional Strategy for glycemic control in patients with type 2 diabetes mellitus users of a Public Health System: NUGLIC study" and "Effectiveness of a Nutritional Strategy for blood pressure control in patients with hypertension users of a Public Health System: NUPRESS study" studies, which are randomized, multicenter, parallel clinical trials (NCT03793855 and NCT03793881). The baseline data were collected from different Brazilian regions from 2019 to 2021. This study was approved by the Research Ethics Committee of the institution (ID: 2019-0644) and written informed consent was obtained from all patients before participation.

This study included adults with a previous medical diagnosis of hypertension or type 2 diabetes mellitus (T2DM), with blood pressure or glycated hemoglobin (HbA1C) off target according to Guidelines of the American Heart Association [5], and American Diabetes Association [3], respectively in the screening period, and who did not receive dietary counseling from a nutritionist for at least six months before the study. Patients with type 1 diabetes, gestational diabetes, latent autoimmune diabetes of adults, or HbA1C $\geq$ 12% were excluded. Other exclusion criteria included: patients with resistant or secondary hypertension diagnosis; severe neuropathy; chronic kidney diseases defined by glomerular filtration rate < 60 mL/min/1.73m² for more than three months; diagnosis of cancer or life expectancy inferior to six months; autoimmune diseases; gastroparesis; pregnancy/lactation; body mass index (BMI) $\geq$40kg/m²; cognitive, neurological, or psychiatric conditions; chemical dependency or alcoholism; episodes of Acute Coronary Syndrome in the last 60 days; wheelchair users; and chronic steroid or antipsychotics users.

Sample size calculation: since the Wheel of Cardiovascular Health Diet is a new tool, no previous studies estimated the sample size calculation. However, our group observed that

patients with low diet quality (assessed using the HEI-2010) had a 2.92 prevalence ratio (95% CI) for glycated hemoglobin outside the target range [15]. Thus, considering the proportion of 66% of patients with type 2 diabetes with low diet quality and off-target for glycemic control observed in a previous study [15], a type I error of 5% and type II error of 20%, and 20% losses (due to implausible food consumption information), the sample size required was a total of 178 subjects. Sample size was estimated using the WinPepi program, version 11.65.

Clinical and anthropometric characteristics

The patients were subjected to clinical, laboratory, and lifestyle assessments. Information about comorbidities and medication use was collected from their electronic medical records during the medical visits on the closest dates to nutritional assessment. Socioeconomic status was evaluated using the Brazilian Criteria for Economic Classification [16], which considers the household characteristics (presence and quantity of given items in the residence), householder's education level, and access to public utility services, and classifies participants from the highest to lowest economic classes: A1, B1, B2, C1, C2, and D/E. The patients were classified as low-income if their socioeconomic strata were C1, C2, or D/E.

Sitting blood pressure was measured thrice after a 5-minute rest using a digital sphygmomanometer (Omron HEM-705CP) [17]. A trained research team obtained the following anthropometric measurements: weight, with patients being barefoot and wearing light clothing; height; and waist circumference (measured at the midpoint between the lowest rib margin and the iliac crest) [18]. Waist circumference cut-off points were defined as 80 cm for women and 94 cm for men, according to International Diabetes Federation criteria [19]. The BMI was calculated as weight (kg)/height (m)^2 and classified according to age [20;21].

Laboratory Measurements

Blood samples were obtained after a 12-hour fast. The plasma glucose was determined by the enzymatic colorimetric method (Roche Diagnostic) [22]. The HbA1C was measured by high-performance liquid chromatography [23] in a Variant II Turbo System. The enzymatic colorimetric method measured serum values of total cholesterol, high-density lipoprotein (HDL) cholesterol, and triglyceride levels [24]. Low-density lipoprotein (LDL) cholesterol was estimated only in patients with triglyceride values < 400 mg/dL, using the Friedewald equation (LDL = total cholesterol − HDL − triglycerides/5) [25]. Serum creatinine was measured by the Jaffé method [26]. The glomerular filtration rate was estimated by the Chronic Kidney Disease Epidemiology Collaboration Calculator [27].

Dietary assessment

Test index: Patient's self-perception by the Wheel of Cardiovascular Health Diet

Patient's evaluation of diet quality was obtained from showing the Wheel of Cardiovascular Health Diet **(Supplemental Figure 1)** image and the respective recommendation for consumption of the portions. The wheel comprises 11 food groups: red meat, fish, seeds/nuts, fruits, vegetables, ultra-processed foods, dairy, processed meat, beans, whole grains, and sugar-sweetened beverages [14]. Each group has an indication for its ideal consumption frequency and amount, based on the nutritional recommendations of the Cardiovascular Health Diet Index [28]. The wheel allows the patient to assess the quality of their own diets: they can attribute "excellent" when they are constantly consuming the recommended portion; "very good" or "good" when they are frequently consuming the recommended portion; "poor" when they are rarely consuming the recommended portion; and "very poor" when they are far from consuming the recommended portion.

Relative reference standard: Healthy Eating Index-2020

Food intake information was obtained from a quantitative Food Frequency Questionnaire (FFQ) [29], which contains 62 items with 11 food groups. A series of images with the average food portion was used to help patients select serving sizes. The FFQ was applied by a previously trained research team (nutritionists or trainees). Reported intake was converted into daily consumption and the nutritional composition was estimated using information from the *Tabela Brasileira de Composição de Alimentos – TACO* (Brazilian Food Composition Table) [30], the United States Department of Agriculture Food Composition Database [31], and nutrition fact labels. Those participants who reported an energy intake lower than the first percentile (576 kcal/d; n = 3) or higher than the 99th percentile (5,456 kcal/d; n = 3) were excluded from the analyses, due to the risk of implausible dietary information.

The latest version of the Healthy Eating Index (HEI-2020), used in this study, includes 13 components [9]: nine adequacy components ("total fruits," including fresh fruit juices; "whole fruits," excluding juices and extracts; "total vegetables"; "greens and beans"; "whole grains"; "dairy"; "total protein foods"; "seafood and plant-based proteins"; and "fatty acids") and four moderation components ("refined grains"; "sodium"; "added sugars"; and "saturated fats"). To each component, a maximum of 10 points are attributed, and, for components divided into two (e.g., total fruits and whole fruits), each subcomponent is allocated 5 points. The standards allow for the application of points for each component so that the total HEI score can range from zero to 100. Diet quality values higher than 75% of the Healthy Eating Index-2020 total were classified as high-quality diets [10,11].

Statistical analyses

The normality of the variables was assessed using the Shapiro-Wilk test. Continuous variables were expressed as mean ± standard deviation or median with interquartile range (IQR), and categorical variables were described as absolute and relative frequencies (%). All

data analyses were performed in PASW Statistics 18.0 (SPSS Inc., Chicago, IL), and a p-value < 0.05 (two-tailed) was considered statistically significant.

The Wheel of Cardiovascular Health Diet and the Healthy Eating Index-2020 were put into graphs according to Krebs-Smith et al. who suggest evaluating the overall diet quality using a radar chart [9], and **Supplemental File (page 2 and Figures S2-S6)** shows a detailed description and an example of the chart. Briefly, each chart represents a circle and each scoring item has a radius of 1 cm.

The area of a circle graph is "$\pi \times$ circle radius^2," and in the Wheel of Cardiovascular Health Diet, the circle radius = 5, considering that it shows 5-score items. Thus, the area of the graph was calculated as "$3.14 \times 5^2 = 78.5$." Then the area of each group and each item score gap was identified. To determine each person's score, items that were not fully scored from the total area were excluded. There are 11 food groups: the area corresponding to each group was calculated (78.5/11 = 7.14) and then divided by 5 (the maximum value that can be scored), and the result was the area of each sub-item score gap of the food group (7.14/5 = 1.43). If the participant scored 5 for a group, for example, the area they filled in for that group would be $5 \times$ 1.43 (area of each sub-item). Finally, cross-multiplication was used to find the percentage of the filled area in the graph (for example, $57.2 \times 100/78.5 = 72.86\%$, considering the total area as 57.2).

The same calculation was applied for the graphic area of the Healthy Eating Index-2020: the circle radius = 10, considering that there are items scored 10 points. Thus, the area of the graph was calculated as "$3.14 \times 10^2 = 254.34$." Then the area of each group and each item score gap was identified. To determine each person's score, items that were not fully scored from the total area were excluded. There are 13 food groups: the area corresponding to each group was calculated (254.34/13 = 19.6); then divided by 10 (the maximum value that can be scored), and the result was the area of each sub-item score gap of the food group (19.6/10 =

1.96). If the participant scored 7.35 for a group, for example, the area they filled in for that group would be 7.35 × 1.96 (area of each sub-item). Finally, to find the percentage of the filled area in the graph, cross-multiplication was used (for example, 157 × 100/254.34 = 61.72%, considering the total area as 157).

Validity and Reliability of the Wheel of Cardiovascular Health Diet

The performance of the Wheel of Cardiovascular Health Diet was measured using strategies for assessing construct validity and reliability, as proposed by Reedy et al. [11]. The validity of the Wheel of Cardiovascular Health Diet was also verified by relating it to overall dietary quality evaluated by the Healthy Eating Index-2020 as a relative reference standard [9,10].

Internal Reliability

To evaluate reliability regarding internal consistency of the Wheel of Cardiovascular Health Diet, the item-item correlation among the 11 components was evaluated to better understand the relationships among them. Cronbach's alpha coefficient was used to assess internal reliability; this statistic estimates the average of the correlations among all possible combinations [32].

Construct Validity

Construct validity evaluates how satisfactory an index measures what it should measure [11]. Thus, to assess the construct validity of the Wheel of Cardiovascular Health Diet, the item-item correlation among the 11 components was used, also principal component analysis (PCA) was used to verify whether the score structure had another factor that explained the data variability. In the PCA analysis, the correlation matrix was obtained using varimax rotation, and only eigenvalues > 1 were used to determine the number of factors [33]. The Scree test was used as an auxiliary method, since it showed the variation of each of the main components or factors [34].

Criterion Validity

Criterion validity (concordance) was evaluated by the Spearman's correlation coefficient between the total graphic area of patients' self-perception from the Wheel of Cardiovascular Health Diet and the Healthy Eating Index-2020, used as a relative reference. An analysis of concordance for the total graphic area was performed using the Bland-Altman plot method, which evaluates the mean difference between the two tools and considers the variability in these differences among individuals [35]. Linear regression models were used to investigate a possible association between a 10-point increase in patients' self-perception from the Wheel of Cardiovascular Health Diet and the variability of diet quality by the Healthy Eating Index-2020, as the dependent variable, after adjusting for possible confounders, selected according to clinical relevance or significance on univariate analysis.

A receiver operator characteristic (ROC) curve was constructed to evaluate the accuracy of patients' self-perceived diet quality in the Wheel of Cardiovascular Health Diet for a high-quality diet according to the Healthy Eating Index-2020 (values higher than 75%). A cutoff in the patients' self-perception in the Wheel of Cardiovascular Health Diet graphic area was established based on the balance between sensitivity, specificity, and positive predictive values (prioritizing positive predictive values). Models of logistic regression were used to investigate a possible association between patients' self-perceived diet quality in the Wheel of Cardiovascular Health Diet and high-quality diet according to the Healthy Eating Index-2020 [9-11] (dependent variable), after adjusting for variable confounders chosen according to univariate analyses or clinical relevance.

Predictive Validity

Patients were divided into two groups according to the overall self-perceived diet quality cutoff in the Wheel of Cardiovascular Health Diet graphic area, and the characteristics of these groups were compared using the Chi-Square test or the Mann-Whitney U-test, as

appropriate. Linear regression models were used to investigate a possible association between a patients' self-perception in the Wheel of Cardiovascular Health Diet (10-point increase and high quality) and BMI, as the dependent variable. Analyses were performed with BMI (crude) and adjusted for possible confounders, selected according to clinical relevance or significance on univariate analysis.

Results

A total of 330 patients were included in the study: with a median age of 58 (50–65) years; mostly females (64.8%); 21.5% were classified as low income; 6.4% were smokers; 54.8% presented a sedentary lifestyle; 91.5% had hypertension; 58.5% had a T2DM diagnosis; and 70.8% presented a 10-year high/very high risk of cardiovascular (CVD) events according to the HEARTs calculator. The filling area of the graph that assessed diet quality had a median of 61.9% (52.8–71.0%) for the patients' self-perception in the Wheel of Cardiovascular Health Diet and a median of 72.4% (64.3–78.1%) for the Healthy Eating Index-2020. The performance results of the Cardiovascular Health Wheel Diet and the strategies used to assess their validity (internal reliability, construct validity, criterion validity, and predictive validity) are described below.

Internal Reliability

Cronbach's alpha value was 0.71. All correlations between the components were generally low to moderate, and **Supplemental Table 1 (S1)** shows the inter-item correlation matrix. Higher correlations were found between processed meat and ultra-processed food (0.43), whole grains and seed and nuts (0.40), and fruits and vegetables (0.39).

Construct Validity

The principal component analysis (PCA) revealed several factors that explain the variability of the Wheel of Cardiovascular Health Diet. The Scree plot illustrated that no single

linear combination of the 11 components of the Wheel of Cardiovascular Health Diet was responsible for a significant proportion of data covariance. **Supplemental Figure 7** shows two factors with an eigenvalue > 1, and that the line seems to stagnate after the third factor.

Criterion Validity

The validity of the diet quality assessment was evaluated considering the Healthy Eating Index-2020 as a relative reference. **Figure 1A** indicates the agreement between the total graphic area of patients' self-perception in the Wheel of Cardiovascular Health Diet, with the Healthy Eating Index-2020 evaluated by the Bland-Altman plot method. The mean difference (agreement range) observed between the percentage of the graphic area assessed by the patients' self-perception and the Healthy Eating Index-2020 was −10.0% (95%CI −35.3 to 15.3). A moderate correlation (α = 0.386; p < 0.0001) was observed between the total graphic area of patients' self-perception in the Wheel of Cardiovascular Health Diet and the Healthy Eating Index-2020, as shown in the dispersion plot (**Figure 1B)**. Linear Regression models showed that a 10-point increase in the patients' self-perception in the Wheel of Cardiovascular Health Diet is associated with a 2.9% variability (95%CI 2.08 to 3.70; p < 0.0001) of diet quality by the Healthy Eating Index-2020, after being adjusted for age, sex, sedentary lifestyle, smoking, BMI, and total energy intake.

In total, 125 patients (37.8% of the total) had diet quality values higher than 75% in the Healthy Eating Index-2020, thus having a high-quality diet [10,11]. Considering this aspect as an outcome (relative standard reference), the area under the ROC curve to patients' self-perception in the Wheel of Cardiovascular Health Diet was calculated [0.68 (95%CI 0.62 to 0.74); p < 0.001]. The 70% cutoff to patients' self-perception in the Wheel of Cardiovascular Health Diet showed 36.8% sensitivity, 82.0% specificity, and 55.2% PPV to discriminate higher diet quality from the Healthy Eating Index-2020. Patients with self-perception higher than 70% in the Wheel of Cardiovascular Health Diet had a 2.32 times chance (95%CI 1.33 to

4.02; $p < 0.001$) of having a high-quality diet according to the Healthy Eating Index-2020, after adjusted for age, sex, low income, sedentary lifestyle, BMI, and 10-year risk of CVD event rates in logistic regression models. A 10-point increase in patients' self-perceived diet quality was associated with a 1.63 times chance (95%CI 1.31 to 2.02; $p < 0.001$) of having a high-quality diet according to the Healthy Eating Index-2020, after adjusting for the same confounders.

Predictive validity

The patients were divided into two groups (high and low self-perceived diet quality) according to the patients' overall self-perceived diet quality cutoff (> 70%) in the Wheel of Cardiovascular Health Diet graphic area. As expected, a more significant proportion of patients classified as having a high-quality diet by the Healthy Eating Index-2020 was observed in the high-quality diet self-perception group than in the low-quality diet self-perception group: [46 (55.4%) *vs* 79 (32.0%); $p < 0.001$]. **Table 1** shows the main clinical and metabolic characteristics of patients according to high or low self-perceived diet quality. Patients in the high diet quality self-perception group were older and presented a lower BMI than those with low diet quality self-perception.

Considering a BMI cutoff according to age [19;20], a greater proportion of patients with a eutrophic BMI was observed among the high diet quality self-perception group compared with the low diet quality self-perception group: 24.1% of patients *vs.* 13.4% of patients ($p = 0.021$ by Chi-square test). **Table 2** shows Linear Regression models: a high self-perceived diet quality in the Wheel of Cardiovascular Health Diet is associated with BMI with variability of −1.20 kg/m² (95%CI −2.37 to −0.03; $p < 0.05$), after adjusting for age, sex, low income, sedentary lifestyle, and 10-year risk of CVD event. A 10-point increase in patients' self-perception in the Wheel of Cardiovascular Health Diet is associated with BMI at a variability of −0.42 kg/m² (95%CI −0.83 to −0.01; $p < 0.05$), after the same adjustments**.**

Discussion

In this study, we hypothesized that patients' self-perception in the Wheel of Cardiovascular Health Diet could appropriately assess their diet quality , when compared with the Healthy Eating Index-2020 (relative reference). Also, we speculated if it could be used in behavior-changing strategies for diet-related chronic diseases. The Wheel of Cardiovascular Health Diet did perform satisfactorily regarding validity and reliability and was associated with higher overall dietary quality using the Healthy Eating Index-2020 as a relative reference (PR = 2.32; 95%CI 1.33 to 4.02). When considering BMI values to evaluate a predictive validity, a 10-point increase in patients' self-perception in the Wheel of Cardiovascular Health Diet is associated with a −0.42 kg/m² decrease (95%CI −0.83 to −0.01).

The Wheel of Cardiovascular Health Diet presented a 0.71 reliability coefficient, as assessed by internal consistency (Cronbach's alpha), suggesting that the wheel captures an underlying construct of overall diet quality [11]. This statistic measures the internal consistency of an index, and values higher than 0.70 indicate accepted reliability [35], although some authors found values from 0.22 to 0.68 in different indexes of dietary evaluation [36-40]. The coefficient is particularly affected by whether the construct is unidimensional or multidimensional, the heterogeneity of the sample, and the homogeneity among items [11]. Given these characteristics, the Cronbach's alpha value found with the Wheel of Cardiovascular Health Diet was already expected to be lower, which means that it can be considered acceptable.

Construct validity was confirmed according to criteria established in the literature [11]. The PCA showed no evidence for a single, systematic underlying relationship among all the Wheel of Cardiovascular Health Diet components responsible for explaining a substantial part of the index variation, that is, no single linear combination of the 11 components explained the

data variation. The correlations between the component scores varied from low to moderate. These results demonstrated good construct validity in the Wheel of Cardiovascular Health Diet, as described by other indexes in the literature [36-40].

In addition, logistic regression models showed that patients with self-perception above 70% in the Wheel of Cardiovascular Health Diet had a 2.32 chance of having a high-quality diet according to the Healthy Eating Index-2020, as described by other authors [41] in a similar study on a new dietary index validation that took the Healthy Eating Index-2015 as a relative reference [41]. Our tool is a new instrument, which limits the comparison of our findings with those of other authors, but we hope that such comparison can happen in future studies. Linear regression models showed that a 10-point increase in patients' self-perception in the Wheel of Cardiovascular Health Diet is associated with lower BMI. In fact, previous epidemiologic studies using the Healthy Eating Index-2015 or another diet quality tool observed an inverse association between higher diet quality and BMI [42-44].

This study has some limitations and strengths. The sample was selected since they participated in two randomized clinical trials, and therefore do not represent the general population, this is probably why we found no difference between the metabolic markers in this study. It has a cross-sectional design and the assessment was carried out in a single moment, thus individuals with self-perceived adequate consumption may have made recent changes and this consumption data may not be long-standing. Carrying out a longitudinal assessment of the Wheel of Cardiovascular Health Diet, aiming to evaluate the influence in changing eating behaviors and possible association with metabolic markers, is a perspective. The FFQ used in this study has been previously constructed and validated [29] for Brazilian patients, it is a self-report method and may be affected by memory bias. Also, it can become tiring due to its number of items, and it contains a limited list of food, which hampers accurately measuring the amount consumed. Despite this, the Wheel of Cardiovascular Health Diet is a unique

instrument that assesses dietary intake by food group, not just by nutrient content. The analysis of dietary patterns has an advantage over the analysis of isolated nutrients, which is important for people who do not ingest isolated nutrients. People's meals are composed of many foods with complex nutrient combinations, thus this tool facilitates interpretation or translation of information into diets.

The Wheel of Cardiovascular Health Diet showed good reliability and proved to be valid for use as an instrument to assess self-perceived dietary quality by individuals with chronic diseases. Although the steps of the counseling process are common to all patients, they happen in a particular way for each one, and the use of the Wheel of Cardiovascular Health Diet is expected to help with eating-behavior changes in the best possible way, considering the relevance of nutritional counseling. Assessing whether the Wheel of Cardiovascular Health Diet performs well in clinical trials and whether it reflects behavior changes over time would also be interesting.

Table 1. Clinical and metabolic characteristics according to patients' self-perceived diet quality in the Wheel of Cardiovascular Health Diet (n = 330)

Characteristic	Patients' self-perception		
	Low-quality diet	High-quality diet	P-value
	56.4 (49.1–63.7)	76.5 (72.4–80.1)	-
n	247	83	
High quality by HEI-2020	79 (32.0%)	46 (55.4%)	**<0.001**†
Age, years	57 (48-64)	61 (51-67)	**0.010**‡
Female, n (%)	155 (62.8)	59 (71.1)	0.169†
Low income, n (%)	51 (20.6)	20 (24.1)	0.804†
Smoker, n (%)	16 (6.5)	5 (6.0)	0.884†
Former smoker, n (%)	171 (69.2)	57 (68.7)	0.924†

Sedentary lifestyle, n (%)	140 (56.7)	41 (49.4)	0.249†
Type 2 Diabetes, n (%)	142 (57.5)	51 (61.4)	0.527†
Hypertension, n (%)	228 (92.3)	74 (89.2)	0.373†
BMI, kg/m²	30.6 (27.5-34.2)	29.6 (26.9-33.0)	**0.024**‡
Altered waist circumference, n (%)	226 (91.5)	77 (92.8)	0.714†
Plasma glucose, mg/dL	114.0 (92-168)	112.5 (93-144)	0.247‡
HbA1c, % (all, n = 330)	6.6 (5.6-8.8)	7.2 (5.8-8.7)	0.266‡
Total cholesterol, mg/dL	191 (159.5-231.5)	189.5 (152.5-218.5)	0.675‡
HDL-cholesterol, mg/dL	49.0 (41-59)	51.0 (43-60)	0.194‡
LDL-cholesterol, mg/dL	100.2 (78.4-135.8)	108.6 (73.1-129.5)	0.845‡
Triglycerides, mg/dL	136.0 (99.5-206)	126.5 (87.2-181)	0.172‡
Serum creatinine, mg/dL	0.90 (0.78-1.05)	0.80 (0.73-0.96)	0.081‡
GFR, mL/min/1.73 m^2	75.6 (63.6-88.6)	75.5 (65.9-80.0)	0.701‡

Data are expressed as medians (interquartile range) or absolute numbers (percentage); ‡Mann-Whitney U test. †Chi-square test. *Values refer to % of the total graphic area. BMI = Body mass index. HbA1c = Glycated hemoglobin. eGFR = Estimated glomerular filtration rate.

Table 2. Linear Regression Models that investigate a possible association between patients' self-perception in Wheel of Cardiovascular Health Diet and BMI values (as a dependent variable)

		Crude		Model 1		Model 2	
	n	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
high self-perceived diet quality*	330	-1.26**	-2.42; -0.11	-1.20**	-2.36; -0.03	-1.20**	-2.37; -0.03
10-point increase in patients' self-perceived diet quality	330	-0.41**	-0.82; -0.02	-0.42**	-0.83; -0.01	-0.42**	-0.83; -0.01

*high self-perceived diet quality according to the overall diet quality cutoff (>70%) patients' self-perception in the Wheel of Cardiovascular Health Diet graphic area

** *P*-value <0.05

Model 1 = adjusted for age, sex, low income, and sedentary lifestyle.

Model 2 = adjusted for Model 1 + 10-year risk of CVD event.

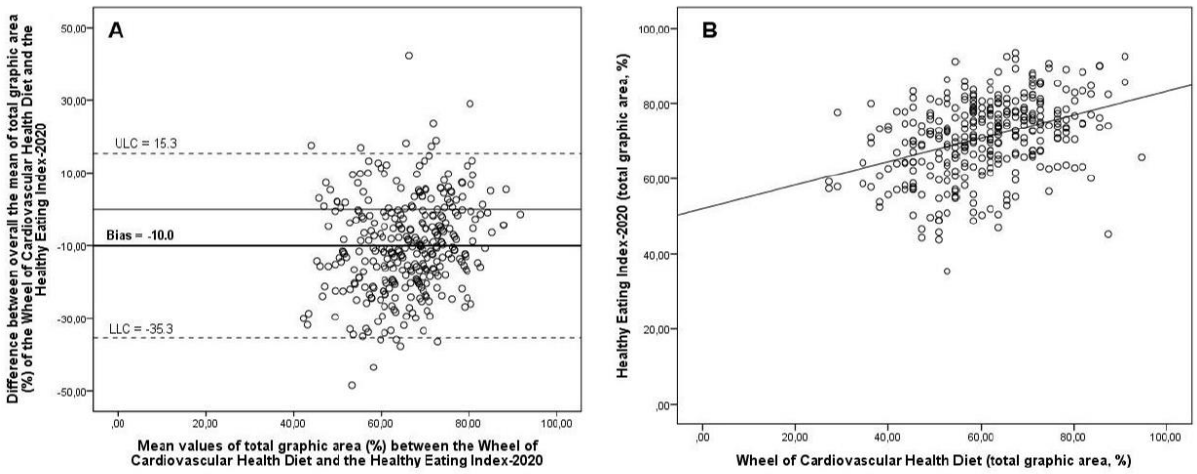

Figure 1. A) Bland-Altman analysis of the differences between the mean of the total graphic area (%) of the patients' self-perception in the Wheel of Cardiovascular Health Diet and the Healthy Eating Index-2020 (relative reference standard; n = 330). Solid line represents the mean value of the difference between the Wheel of Cardiovascular Health Diet and the Healthy Eating Index-2020. The dotted lines represent the limit of agreement, where LLC is the lower limit of concordance and ULC is the upper limit of concordance. B) Dispersion plot of the total graphic area (%) of the patients' self-perception in the Wheel of Cardiovascular Health Diet and the Healthy Eating Index-2020 (n = 330). Spearman coefficient correlation = 0.386 ($p < 0.0001$).

Supplemental materials

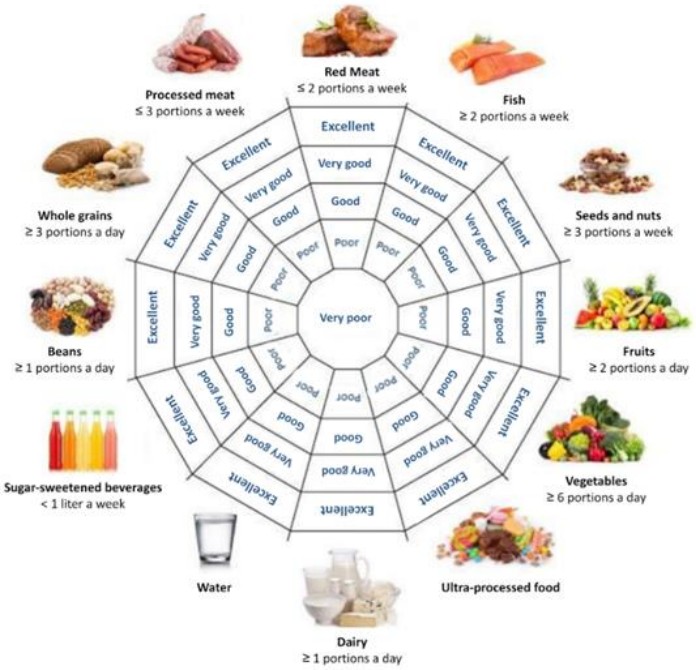

Figure S1. Wheel of Cardiovascular Health Diet. Patients can attribute "excellent" when they are consuming the recommended portion, and "very poor" when they are far from consuming the recommended portion.

Calculating the graphic area

We studied alternative ways of comparing the Healthy Eating Index-2020 and the Wheel of Cardiovascular Health Diet, a way to evaluate the agreement between the two tools globally and not through each component. In the Healthy Eating Index-2015 paper, published by Krebs-Smith et al., there is a proposal to build a radar chart to visualize the index score itself. We used this proposed methodology to construct a graph for the Healthy Eating Index-2020 and the Wheel

of Cardiovascular Health Diet. As a way of comparing the instruments, we calculated the area of both graphs. It was considered that each graph represents a circle and that each scoring item has a radius of 1 cm.

The value of the total area of the graph was calculated. The area of a circle graph is "π x circle radius² ", and in the Wheel of Cardiovascular Health Diet, the circle radius = 5, considering that there are 5 scores items. Thus, the area of the graph was calculated as "3.14 x 5^2 = 78.5." Then the area of each group and each item's score gap was identified. To determine each person's score, items that were not fully scored from the total area were excluded. There are 11 food groups: the area corresponding to each group was calculated (78.5/11 = 7.14); and then divided by 5 (the maximum value that can be scored), and the result was the area of each sub-item score gap of the food group (7.14/5 = 1.43). If the participant scored 5 for a group, for example, the area they filled in for that group would be 5 x 1.43 (area of each sub-item). Finally, cross-multiplication was used to find the percentage of the filled area in the graph (for example, 57.2 x 100/78.5 = 72.86%, considering the total graphic area as 57.2).

For the graphic area of the Healthy Eating Index-2020, the same was applied, but the circle radius was 10, considering that there are 10 scores items.

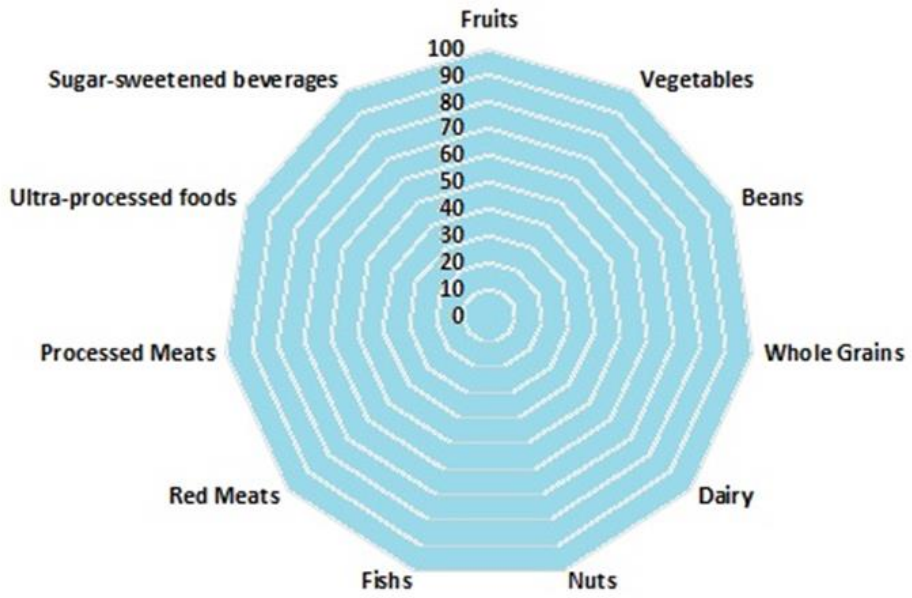

Figure S2. Total graphic area filled (100%).

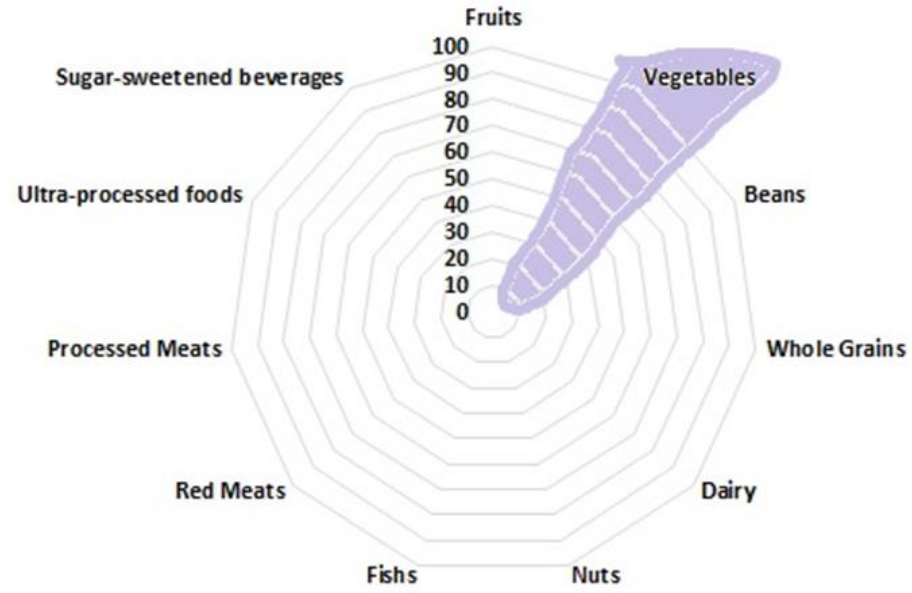

Figure S3. The area of each group filled, example of vegetables group (7.14).

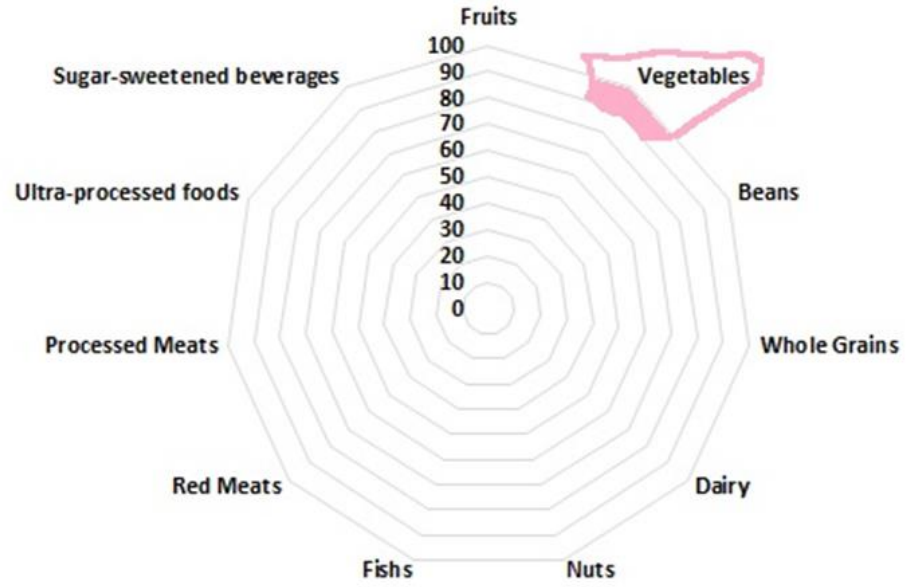

Figure S4. Area of each sub-item score gap of the food group, example of vegetables group (1.43).

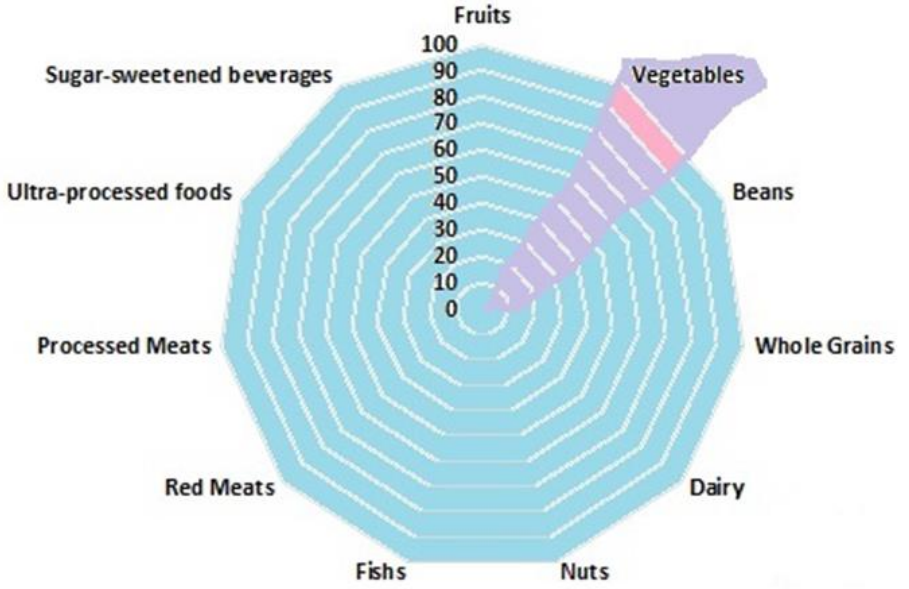

Figura S5. A graphic area filled with the example of vegetables group.

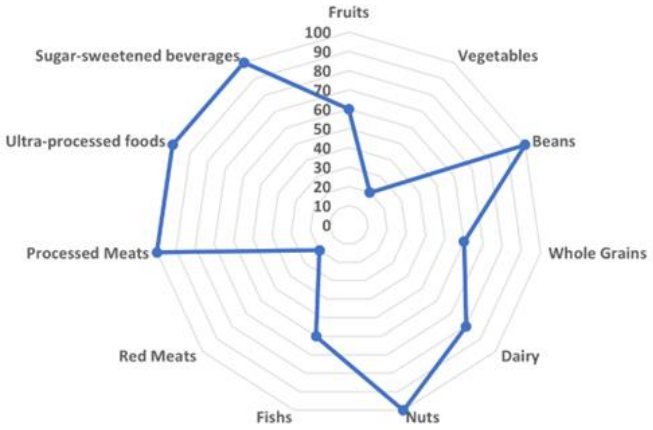

Figure S6. A graphic area of a patient with 72.86% of the Wheel of Cardiovascular Health Diet completed.

Table S1. Correlation between Wheel of Cardiovascular Health Diet score components and each component.

Component	Fruits	Vegetables	Fish	Red meat	SSB	Whole grains	Beans	Seed and nuts	Processed meat	Dairy	UPF
Fruits	-										
Vegetables	0.39										
Fish	0.12	0.19									
Red meat	0.18	0.13	0.16								
Sugar-sweetened beverages (SSB)	0.30	0.25	-0.00	0.12							
Whole grains	0.33	0.26	0.19	0.20	0.25						
Beans	0.06	0.05	0.04	-0.02	0.16	0.09					

Seeds and nuts	0.27	0.30	0.26	0.08	0.22	0.40	0.02				
Processed meat	0.22	0.23	-0.01	0.18	0.28	0.21	0.19	0.10			
Dairy	0.19	0.18	-0.02	0.02	0.12	0.18	0.15	0.13	0.25		
Ultra-processed food (UPF)	0.20	0.30	0.05	0.13	0.37	0.23	0.15	0.28	0.43	0.19	-

Internal Reliability: Inter-item correlation matrix.

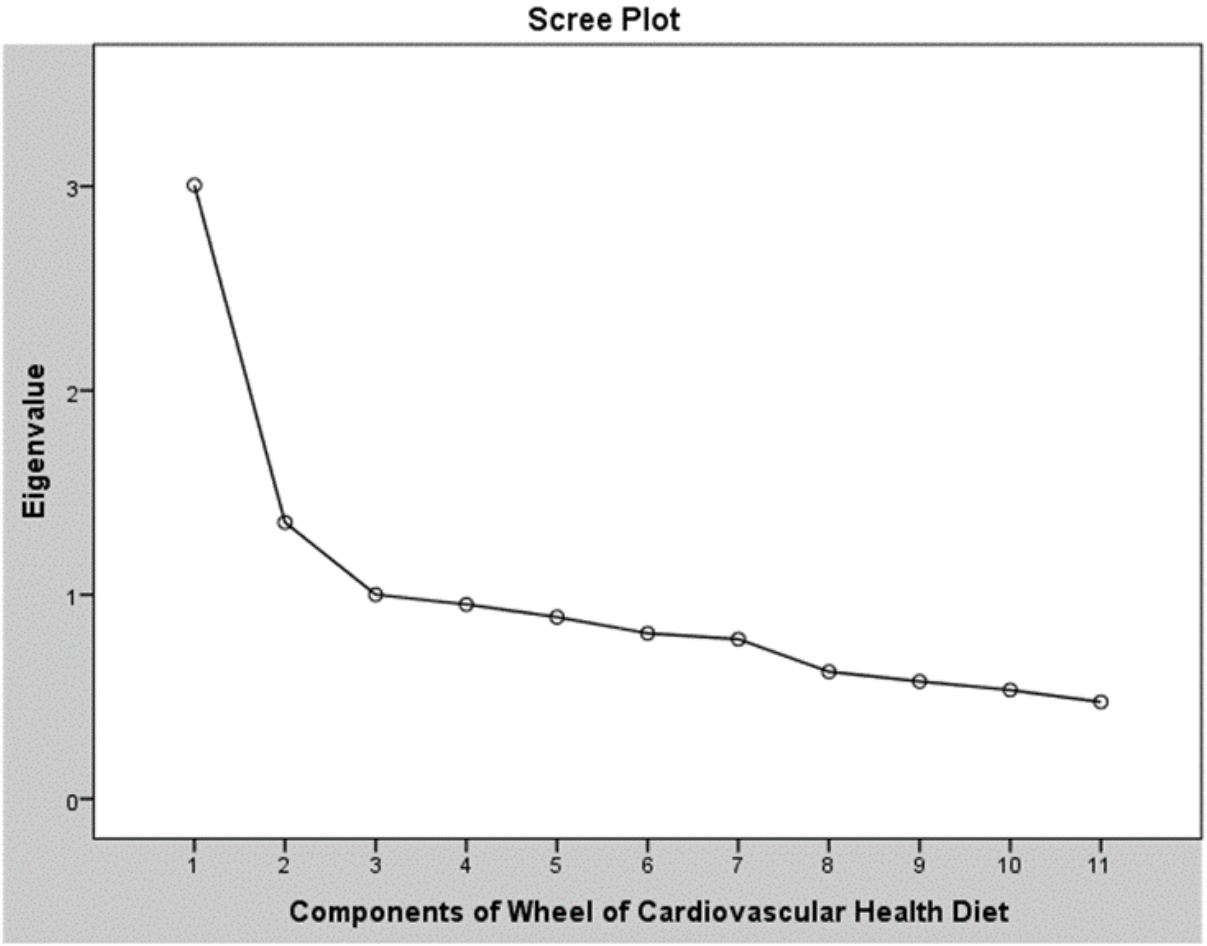

Figure S7. Scree plot from the principal components analysis (PCA) of the Wheel of Cardiovascular Health Diet

References

1. World Health Organization. Cardiovascular Diseases, 2021 [accessed 10 May 2023]. https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).

2. Fereidouni S, Hejazi N, Homayounfar R, Farjam M. Diet quality and dietary acid load in relation to cardiovascular disease mortality: Results from Fasa PERSIAN cohort study. Food Sci Nutr 2022;11:1563-1571. doi: 10.1002/fsn3.3197.

3. American Diabetes Association. Standards of Medical Care in Diabetes—2023. Diabetes Care 2023;46:S68–S96. doi: 10.2337/dc23-S005.

4. Vasiloglou MF, Fletcher J, Poulia KA. Challenges and Perspectives in Nutritional Counselling and Nursing: A Narrative Review. J Clin Med 2019;8:1489. doi: 10.3390/jcm8091489.

5. Arnett DK, Blumenthal RS, Albert MA, Buroker AB, Goldberger ZD, Hahn EJ, Himmelfarb CD, Khera A, Lloyd-Jones D, McEvoy JW, et al. 2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease: A Report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Circulation 2019;140:e596-e646. doi: 10.1161/CIR.0000000000000678.

6. Aerts N, Le Goff D, Odorico M, Le Reste JY, Van Bogaert P, Peremans L, Musinguzi G, Van Royen P, Bastiaens H. Systematic review of international clinical guidelines for the promotion of physical activity for the primary prevention of cardiovascular diseases. BMC Fam Pract 2021; 22:97. doi: 10.1186/s12875-021-01409-9.

7. Rutten GEHM, Van Vugt H, de Koning E. Person-centered diabetes care and patient activation in people with type 2 diabetes. BMJ Open Diabetes Res Care 2020;8:e001926. doi: 10.1136/bmjdrc-2020-001926.

8. Hu EA, Steffen LM, Coresh J, Appel LJ, Rebholz CM. Adherence to the healthy eating index-2015 and other dietary patterns may reduce risk of cardiovascular disease, cardiovascular mortality, and all-cause mortality. J Nutr 2020;150:312–21. doi: 10.1093/jn/nxz218.

9. Krebs-Smith SM, Pannucci TE, Subar AF, Kirkpatrick SI, Lerman JL, Tooze JA, Wilson MM, Reedy J. Update of the Healthy Eating Index: HEI-2015. J Acad Nutr Diet 2018;118:1591-1602. doi: 10.1016/j.jand.2018.05.021.

10. Shams-White MM, Pannucci TE, Lerman JL, Herrick KA, Zimmer M, Meyers Mathieu K, Stoody EE, Reedy J. Healthy Eating Index-2020: Review and Update Process to Reflect the Dietary Guidelines for Americans 2020-2025. J Acad Nutr Diet. 2023:16:S2212-2672. doi: 10.1016/j.jand.2023.05.015.

11. Reedy J, Lerman JL, Krebs-Smith SM, Kirkpatrick SI, Pannucci TE, Wilson MM, Subar AF, Kahle LL, Tooze JA.. Evaluation of the Healthy Eating Index-2015. J Acad Nutr Diet 2018;118:1622-33. doi: 10.1016/j.jand.2018.05.019.

12. Gil A, Victoria EM, Olza J. Indicators for the evaluation of diet quality. Nutr Hosp 2015; 26;31 Supl. 3:128-144. doi: 10.3305/nh.2015.31.sup3.8761.

13. Byrne U. Wheel of Life: Effective steps for stress management. Business Information Review 2005;22: 123–130. doi: 10.1177/0266382105054770.

14. Chites VS. Avaliação da qualidade da dieta a partir da teia alimentar : desempenho da autopercepção do paciente em comparação com a avaliação da nutricionista. Universidade Federal do Rio Grande do Sul. Faculdade de Medicina. Programa de Pós-Graduação em Ciências Médicas: Endocrinologia. Porto Alegre, 2022.

15. Antonio JP, Sarmento RA, de Almeida JC. Diet Quality and Glycemic Control in Patients with Type 2 Diabetes. J Acad Nutr Diet. 2019 Apr;119(4):652-658. doi: 10.1016/j.jand.2018.11.006.

16. Associação Brasileira de Empresas de Pesquisa. Critério de Classificação Econômica Brasil, 2016 [accessed 10 March 2023]. http://www.abep.org/criterio-brasil.

17. O'Brien E, Waeber B, Parati G, Staessen J, Myers MG. Blood pressure measuring devices: recommendations of the European Society of Hypertension. BMJ 2001;322:531-536. doi: 10.1136/bmj.322.7285.531

18. Gibson RS. Anthropometric assessment of growth. In: Principles of nutritional assessment. 1st edition. New York, NY: Oxford University Press; 1990: 195.

19. International Diabetes Federation. The IDF consensus worldwide definition of the metabolic syndrome, 2006. [accessed 10 March 2023] https://www.idf.org/e-library/consensus-statements.

20. World Health Organization. Global Database on Body Mass Index, BMI classification, 2006. [accessed 10 March 2023] http://www.assessmentpsychology.com/icbmi.htm.

21. Lipschitz DA. Screening for nutritional status in the elderly. Prim Care 1994;21:55e67.

22. Trinder P. Determination of blood glucose using an oxidase peroxidase system with a noncarcinogenic chromogen. J Clin Pathol, 1969;22:158-61. doi: 10.1136/jcp.22.2.158.

23. Camargo JL, Zelmanovitz T, Paggi A, Friedman R, Gross JL. Accuracy of conversion formulae for estimation of glycohaemoglobin. Scand J Clin Lab Invest 1998;58:521-8. doi: 10.1080/00365519850186337.

24. Farish E, Fletcher CD. A comparison of two micro-methods for the determination of HDL2 and HDL3 cholesterol. Clin Chim Acta, 1983;129:221-8. doi: 10.1016/0009-8981(83)90220-6.

25. Friedewald WT, Levy RI, Fredrickson DS. Estimation of the concentration of low-density lipoprotein cholesterol in plasma, without use of the preparative ultracentrifuge. Clin Chem, 1972;18:499-502. doi: 10.1093/clinchem/18.6.499

26. Fabiny DL, Ertingshausen G. Automated reaction-rate method for determination of serum creatinine with the CentrifiChem. Clin Chem 1971;17:696-700. doi: 10.1093/clinchem/17.8.696.

27. Chronic Kidney Disease Epidemiology Collaboration. GFR calculator. http://ckdepi.org/equations/gfr-calculator/

28. Cacau LT, Marcadenti A, Bersch-Ferreira AC, Weber B, de Almeida JC, Rodrigues CCR, Lotufo PA, Bensenor IM, Marchioni DM. The AHA Recommendations for a Healthy Diet and Ultra-Processed Foods: Building a New Diet Quality Index. Front Nutr 2022;11:804121. doi: 10.3389/fnut.2022.804121.

29. Fisberg RM, Colucci ACA, Morimoto JM, Marchioni DML. Questionário de frequência alimentar para adultos com base em estudo populacional. Revista de Saúde Pública 2008;42: 550–554. doi: 10.1590/S0034-89102008005000020.

30. Tabela Brasileira de Composição de Alimentos/ NEPA-UNICAMP, 2014 [accessed 20 Jan 2023]. https://www.nepa.unicamp.br/taco/contar/taco_4_edicao_ampliada_e_revisada.pdf?arquivo=1

31. United States Department of Agriculture. Food Composition Database. [accessed 20 Jan 2023] https://data.nal.usda.gov/dataset/usda-national-nutrient-database-standard-reference-legacy-release.

32. Cronbach, JL. Coefficient alpha and the internal structure of tests. Psychometrika 1951; 16:297-334. doi: 10.1007/BF02310555.

33. Kaiser, HF. The Varimax Criterion for Analytic Rotation in Factor Analysis. Psychometrika 1958;23:187–200. doi: 10.1007/BF02289233.

34. Cattell, RB. The Scree Test for the Number of Factors. Multivar. Behav. Res. 1966;1:245–276. doi: 10.1207/s15327906mbr0102_10.

35. Bland JM, Altman DG. Measuring agreement in method comparison studies. Stat Methods Med Res. 1999;8:135-60. doi: 10.1177/096228029900800204.

36. Guenther PM, Reedy J, Krebs-Smith SM. Development of the healthy eating index-2005. J Am Diet Assoc 2008;108:1896–901. doi: 10.1016/j.jada.2008.08.016

37. Guenther PM, Kirkpatrick SI, Reedy J, Krebs-Smith SM, Buckman DW, Dodd KW, Casavale KO, Carroll RJ. The Healthy Eating Index-2010 Is a Valid and Reliable Measure of Diet Quality according to the 2010 Dietary Guidelines for Americans. J. Nutr 2014; 144:399–407. doi: 10.3945/jn.113.183079.

38. Roy, R.; Hebden, L.; Rangan, A.; Allman-Farinelli, M. Development, Application, and Validation of a Healthy Eating Index for Australian Adults (HEIFA-2013). Nutrition 2016;32:432–440. doi: 10.1016/j.nut.2015.10.006.

39. Yuan YQ, Li F, Wu H, Wang YC, Chen JS, He GS, Li SG, Chen B. Evaluation of the Validity and Reliability of the Chinese Healthy Eating Index. Nutrients 2018;10:114. doi: 10.3390/nu10020114.

40. Cacau LT, De Carli E, de Carvalho AM, Lotufo PA, Moreno LA, Bensenor IM, Marchioni DM. Development and validation of an index based on EAT-lancet recommendations: the planetary health diet index. Nutrients 2021;13:1698. doi: 10.3390/nu13051698.

41. Lara-Breitinger KM, Medina Inojosa JR, Li Z, Kunzova S, Lerman A, Kopecky SL, Lopez-Jimenez F. Validation of a Brief Dietary Questionnaire for Use in Clinical Practice: Mini-EAT (Eating Assessment Tool). J Am Heart Assoc 2023;12:e025064. doi: 10.1161/JAHA.121.025064.

42. Xu Z, Steffen LM, Selvin E, Rebholz CM. Diet quality, change in diet quality and risk of incident CVD and diabetes. Public Health Nutr 2020;23:329-338. doi: 10.1017/S136898001900212X.

43. Vahid F, Jalili M, Rahmani W, Nasiri Z, Bohn T. A Higher Healthy Eating Index Is Associated with Decreased Markers of Inflammation and Lower Odds for Being Overweight/Obese Based on a Case-Control Study. Nutrients 2022;14:5127. doi: 10.3390/nu14235127.

44. Beba M, Seif-Barghi T, Shab-Bidar S, Yarizadeh H, Tijani AJ, Clark CCT, Djafarian K. The association between the Healthy Eating Index (HEI-2015) score and body composition among Iranian soccer players and referees: a cross-sectional study. J Nutr Sci, 2022;11:e57. doi: 10.1017/jns.2022.49.

Capítulo V

Considerações finais

Na presente tese, analisamos o desempenho da “Teia Alimentar” na avaliação da qualidade da dieta de pacientes com alto risco cardiovascular. Em nossos achados iniciais, identificamos que a Teia Alimentar teve desempenho satisfatório quanto à validade e confiabilidade pelo IMC e foi associada à maior qualidade geral da dieta, tendo o *Healthy Eating Index*-2020 como referência relativa. Modelos de Regressão Linear mostraram que um aumento de 10% na autopercepção dos pacientes na Teia Alimentar está associado a um aumento de 2,9% (IC95% 2,08 - 3,70) na qualidade da dieta pelo *Healthy Eating Index*-2020 e está associada a menores valores de IMC: $\beta = -0{,}42 kg/m^2$ (IC95% −0,83; −0,01).

Nossos resultados ainda mostraram que a Teia Alimentar parece ser uma ferramenta atraente para ampliar a consciência alimentar, auxiliando no aconselhamento nutricional e na promoção de perda de peso. Modelos de regressão logística indicaram que uma melhoria de 10% na autopercepção da qualidade da dieta foi correlacionada com um aumento de 2,31 vezes (IC95% = 1,02–5,19) na probabilidade de atingir uma perda de peso de pelo menos 3% seis meses após aconselhamento nutricional, com ajustes para mudanças na atividade física e risco de 10 anos de eventos cardiovasculares.

A Teia Alimentar parece potencializar a conscientização ao fornecer dados sobre a qualidade da dieta e colocar o paciente como protagonista, facilitando a autoavaliação e autoconsciência do comportamento alimentar. Acreditamos que esta maior consciência pode ser sustentada a longo prazo, uma vez que a Teia Alimentar envolve ativamente o paciente, aproveitando o seu conhecimento nutricional prévio como ponto de partida. Entretanto, esta hipótese precisará ser testada em diferentes populações a partir de ensaios clínicos randomizados bem delineados.