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CONSUMO ALIMENTAR SEGUNDO O MÉTODO DOS ESCORES E RISCO CARDIOVASCULAR EM ADOLESCENTES ALAGOANOS QUE VIVEM COM HIV

MONYQUE HELLEN TEIXEIRA DE JESUS

MACEIÓ - 2023

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Dissertação apresentada à Faculdade de Nutrição da Universidade Federal de Alagoas como requisito à obtenção do título de Mestre em Nutrição.

Orientador: Prof. Dr. Luiz Rodrigo Augustemak de Lima
Instituto de Educação Física e Esportes
Universidade Federal de Alagoas
Coorientadora: Profa. Dra. Maria Izabel Siqueira de Andrade
Faculdade de Nutrição
Universidade Federal de Alagoas

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UNIVERSIDADE FEDERAL DE ALAGOAS

Campus A. C. Simões
BR 104, km 14, Tabuleiro dos Martins
Maceió-AL 57072-970
Fone/fax: 81 3214-1160

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por

Monyque Hellen Teixeira de Jesus

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Dra. Yara Maria Franco Moreno
Programa de Pós-Graduação em Nutrição - PPGN
Universidade Federal de Santa Catarina - UFSC
Examinador(a) Externo(a) à Instituição

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SANDRA MARY LIMA VASCONCELOS
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Dra. Sandra Mary Lima Vasconcelos
Programa de Pós-Graduação em Nutrição - PPGNUT
Universidade Federal de Alagoas – UFAL
Examinador(a) Interno(a)

Documento assinado digitalmente
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LUIZ RODRIGO AUGUSTEMAK DE LIMA
Data: 05/03/2023 20:38:33-0300
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Dr. Luiz Rodrigo Augustemak de Lima
Programa de Pós-Graduação em Nutrição - PPGNUT
Universidade Federal de Alagoas – UFAL
Presidente

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Dedico a todos os pacientes do Hospital Escola Dr. Helvio José de Farias Auto – Serviço de Assistência Especializada que se voluntariaram à pesquisa na esperança de uma melhor qualidade de vida.

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RESUMO

JESUS, M. H. T. **Consumo alimentar segundo o método dos escores e risco cardiovascular em adolescentes alagoanos que vivem com HIV**. Dissertação – (Mestrado em Nutrição). Programa de Pós-Graduação em Nutrição, Faculdade de Nutrição, Universidade Federal de Alagoas, Maceió, 2023.

A terapia antirretroviral reduziu a morbimortalidade de indivíduos que vivem com HIV. Contudo, o tratamento possui efeitos adversos que, somado às alterações metabólicas da doença e o estilo de vida não saudável em adolescentes, como a alimentação inadequada, rica em gorduras saturadas/trans, carboidratos refinados, baixa ingestão de fibras e CHO complexos, pode contribuir com a lipodistrofia, dislipidemia, resistência à insulina e hipertensão. Apesar disso, a avaliação da alimentação preditora e protetora do risco cardiovascular em adolescentes com HIV é escassa na literatura científica, tornando difícil o planejamento de ações de prevenção e controle. O objetivo foi avaliar os fatores de risco cardiovasculares e o consumo alimentar, a partir de revisão sistemática e em campo, em adolescentes que vivem com HIV. A partir da revisão, foi identificado a inadequação do consumo alimentar devido a baixa ingestão de fibras e micronutrientes, além do baixo consumo de frutas e vegetais. Outrossim, a associação entre consumo elevado de açúcar e gordura, e baixo em vegetais e frutas foi significativamente associada à síndrome da lipodistrofia; ingestão de gordura e níveis de lipídios plasmáticos. Assim, o consumo alimentar rico em açúcar e gordura, e menor ingestão de frutas, vegetais, fibras e micronutrientes predispõem o risco cardiovascular. Em campo, foi realizado um estudo transversal, envolvendo 34 adolescentes com diagnóstico de HIV. O consumo alimentar foi obtido através do Questionário de Frequência Alimentar e analisado segundo o método dos escores. Os fatores de risco cardiovasculares incluíram o excesso de peso, circunferência da cintura, pressão arterial e percentual de gordura corporal elevadas e níveis indesejáveis para perfil lipídico e glicêmico. A associação entre as variáveis foi realizada através do teste U de Mann-Whitney e Kruskal Wallis, quando aplicável e pela regressão linear simples. Foi verificado uma prevalência de dislipidemia, com 77,7% da população com valores baixos para HDL-c e, em 50,0%, alto valor para triglicerídeos. Houve maior consumo da dieta protetora do risco cardiovascular. Conclui-se o consumo alimentar identificado, rico em alimentos protetores. Apesar

disso, adolescentes com HIV apresentaram o consumo elevado de alguns alimentos preditores do risco. A associação entre consumo de dieta preditora e menor frequência para os fatores de risco cardiometabólicos pode estar atrelada à singularidade do grupo estudado. O consumo elevado de alimentos preditores do risco cardiovascular e presença de fatores de risco cardiovasculares em adolescentes que vivem com HIV são importantes para analisar e desenvolver estratégias de orientações nutricionais.

Palavras-chave: Vírus da imunodeficiência humana. Consumo alimentar. Nutrientes. Doenças cardiovasculares. Adolescentes.

ABSTRACT

JESUS, M. H. T. **Food consumption according to the scoring method and cardiovascular risk in adolescents living with HIV from Alagoas**. Dissertation – (Master in Nutrition). Graduate Program in Nutrition, Faculty of Nutrition, Federal University of Alagoas, Maceió, 2023.

Antiretroviral therapy has reduced morbidity and mortality in individuals living with HIV. However, the treatment has adverse effects that, added to the metabolic alterations of the disease and the unhealthy lifestyle in adolescents, such as inadequate diet, rich in saturated/trans fats, refined carbohydrates, low fiber intake and complex CHO, may contribute with lipodystrophy, dyslipidemia, insulin resistance and hypertension. Despite this, the evaluation of predictive and protective diet for cardiovascular risk in adolescents with HIV is scarce in the scientific literature, making it difficult to plan prevention and control actions. The objective was to evaluate cardiovascular risk factors and food consumption, based on a systematic and field review, in adolescents living with HIV. From the review, inadequate food consumption was identified due to low intake of fiber and micronutrients, in addition to low consumption of fruits and vegetables. Furthermore, the association between high consumption of sugar and fat and low consumption of vegetables and fruits was significantly associated with lipodystrophy syndrome; fat intake and plasma lipid levels. Thus, food consumption rich in sugar and fat, and lower intake of fruits, vegetables, fibers and micronutrients predispose to cardiovascular risk. In the field, a cross-sectional study was carried out, involving 34 adolescents diagnosed with HIV. Food consumption was obtained through the Food Frequency Questionnaire and analyzed according to the scoring method. Cardiovascular risk factors included overweight, waist circumference, high blood pressure and body fat percentage, and undesirable levels for lipid and glycemic profile. The association between the variables was performed using the Mann-Whitney and Kruskal Wallis U test, when applicable, and using simple linear regression. A prevalence of dyslipidemia was verified, with 77.7% of the population having low values for HDL-c and, in 50.0%, high values for triglycerides. There was a higher consumption of the cardiovascular risk protective diet. The identified food consumption is concluded, rich in protective foods. Despite this, adolescents with HIV showed high consumption

of some risk predictor foods. The association between consumption of a predictive diet and lower frequency of cardiometabolic risk factors may be linked to the uniqueness of the studied group. The high consumption of foods that are predictive of cardiovascular risk and the presence of cardiovascular risk factors in adolescents living with HIV are important to analyze and develop nutritional guidance strategies.

Keywords: HIV. Food intake. Nutrients. Cardiovascular diseases. Adolescent.

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LISTA DE ABREVIATURAS

AT – Atividade física

CC – Circunferência da cintura

CEP – Comitê de Ética em Pesquisa

CHO – Carboidratos

cm – Centímetros

CS – Comportamento sedentário

CT – Colesterol total

DCNTs – Doenças Crônicas Não Transmissíveis

DCV – Doenças cardiovasculares

DRIs – Dietary Reference Intakes

HDL-c – High Density Lipoproteins

HIV – Human Immunodeficiency Virus

HEHA-SAE – Hospital Escola Dr. Helvio José de Farias Auto – Serviço de Assistência Especializada

IBGE – Instituto Brasileiro de Geografia e Estatística

IDF – International Diabetes Federation

IGF-1 – Fator de crescimento 1

IMC – Índice de Massa Corporal

LDL-c – Low Density Lipoproteins

LIP – Lipídeos

OMS – Organização Mundial da Saúde

PAS – Pressão arterial sistólica

PAD – Pressão arterial diastólica

PAQ-c – Physical Activity Questionnaire for Children

PCR – Proteína C Reativa

PeNSE – Pesquisa Nacional de Saúde do Escolar

PTN – Proteínas

QFA – Questionário de Frequência Alimentar

SESAU – Secretaria do Estado de Alagoas

SISVAN – Sistema de Vigilância Alimentar e Nutricional

SM – Síndrome Metabólica

TALE – Termo de Assentimento Livre e Esclarecido

TARV – Terapia antirretroviral

TCLE – Termo de Consentimento Livre e Esclarecido

TG – Triglicerídeos

UFAL – Universidade Federal de Alagoas

%GC – Percentual de gordura corporal

SUMÁRIO

1 APRESENTAÇÃO

1 APRESENTAÇÃO

Ao longo das últimas décadas, os indivíduos infectados pelo HIV tiveram um aumento na sobrevida e, como consequência, diminuição da mortalidade devido ao retardo da progressão da doença do HIV, particularmente pela introdução da terapia antirretrovial combinada (TARV) (GORTMAKER et al., 2001; MAGGI et al., 2017). O objetivo principal da utilização dessa terapia é inibir a replicação viral até os níveis indetectáveis, fortalecer a função imunológica e reduzir a incidência de infecções oportunistas, além de abrandar a ativação de citocinas pró-inflamatórias, diminuir o risco de resistência aos antirretrovirais e proporcionar menor toxicidade (ALMEIDA; KOCHI; SÁFADI, 2019; BRASIL, 2012; D'ETTORRE et al., 2016). Dessa forma, a implementação da TARV passou a assegurar o processo de pleno crescimento e desenvolvimento em crianças e adolescentes que vivem com HIV (BRASIL, 2012).

Por outro lado, a TARV possui efeitos adversos que, associado às próprias alterações metabólicas do HIV, como a ativação imunológica crônica, inflamação persistente e senescência, causados pela doença em si, culminam em complicações que podem perdurar pelo resto da vida (MAGGI et al., 2017; SAINZ et al., 2014; STEVEN et al., 2001). Dentre as consequências negativas da TARV e da infecção pelo HIV estão as mudanças de distribuição da gordura corporal, obesidade, dislipidemias e as anormalidades no metabolismo dos CHO (ALMEIDA; KOCHI; SÁFADI, 2019; LEITE; SAMPAIO, 2011; LIMA et al., 2018; SAINZ et al., 2014; SILVA et al., 2010).

Pode ser acompanhada também da síndrome metabólica (SM). Apesar da SM ser um conjunto de alterações metabólicas ligadas ao acúmulo de tecido adiposo corporal, ela pode se relacionar a lipodistrofia associada ao HIV devido a características comuns, como anormalidade na distribuição de gordura corporal, resistência à insulina, alterações lipídicas e aumento do risco cardiovascular (DIEHL et al., 2008). Embora os sintomas clínicos da aterosclerose não surjam na infância, este processo aterogênico inicia desde os primeiros anos de vida, o que pode acarretar no aumento do risco cardiovascular e de eventos ateroscleróticos precoces em adolescentes que

vivem com HIV (ALMEIDA; KOCHI; SÁFADI, 2019; LEITE; SAMPAIO, 2011; LIMA et al., 2018; SAINZ et al., 2014; SILVA et al., 2010).

Independente dessas mudanças terem origem na evolução da doença ou pelas alterações adversas da TARV, as crianças e os adolescentes que vivem com HIV podem apresentar alterações metabólicas que culminam em modificação da composição corporal, como o acúmulo de gordura na região do tronco, aumentando assim os riscos cardiovasculares (MARTINS et al., 2017). Somado a isto, atualmente, grande parte da população está crescendo em um ambiente obesogênico, o qual resulta em hábitos de vida não saudáveis, como o consumo elevado de alimentos ultraprocessados e de baixo valor nutritivo, com alto teor de gorduras, açúcar e/ou sódio, além do sedentarismo, que leva ao ganho de peso e ao surgimento de Doenças Crônicas Não Transmissíveis (DCNTs) (RONCA, 2017). Entre as DCNTs, as doenças cardiovasculares (DCV) estão em evidência e surgindo cada vez mais cedo na população geral (BECK et al., 2011). Nessa perspectiva, indivíduos que vivem com HIV em TARV e que, apresentam o consumo de dieta preditora para DCV, estariam em vulnerabilidade para o desenvolvimento desse agravo (FERREIRA; BARBOSA; VASCONCELOS, 2019).

A literatura científica descreve que o padrão alimentar dos adolescentes brasileiros consiste em alimentos tradicionais (pão e café) e alimentos não saudáveis, sendo a região Nordeste com maior evidência desse padrão (ALVES et al., 2019). Os alimentos ultraprocessados são mais consumidos pelos adolescentes em todo país, culminando na elevação da ingestão de gorduras, açúcares, sódio e baixo consumo de frutas e hortaliças (TAVARES et al., 2014). A inadequação da composição da dieta, principalmente com elevado teor lipídico e com baixo teor de fibras alimentares, associado às complicações do HIV e aos efeitos adversos da TARV, podem ser responsáveis por alterar o perfil lipídico nessa população e aumentar os fatores de risco cardiovasculares (PEREIRA et al., 2019).

O estudo de Werner et al. (2010) descreveu o perfil lipídico, possíveis alterações de distribuição da gordura corporal e fatores de risco cardiovasculares em crianças e adolescentes infectados pelo HIV, utilizando-

se do QFA e de comparações entre o consumo alimentar identificado e as recomendações nutricionais da *American Heart Association* e *Dietary Reference Intakes* (DRIs). Os autores identificaram que 53,5% da amostra ingeriam energia acima das recomendações, outrossim, indivíduos acima de 9 anos consumiam alimentos com fontes de colesterol acima das recomendações, enquanto a ingestão de comidas com alto teor de fibras alimentares era inferior ao recomendado. Portanto, pelo menos 50% dos indivíduos apresentaram alterações em triglicerídeos séricos, 16,6% em LDL-c, 66,6% em HDL-c e 33,3% em colesterol total. Por fim, 9,3% foram identificados com lipoatrofia e 4,7% com lipohipertrofia (WERNER et al., 2010).

Medeiros et al. (2021) analisaram a ingestão habitual dos alimentos pelo recordatório de 24 horas e o marcador de ingestão alimentar do Sistema de Vigilância Alimentar e Nutricional (SISVAN) do Ministério da Saúde (Brasil) em crianças e adolescentes que vivem com HIV. Os pesquisadores detectaram baixo consumo de fibras e de energia, ingestão de macronutrientes dentro das recomendações, exceto para gorduras, que na segunda fase estavam abaixo do recomendado. Por outro lado, após três orientações nutricionais ocorridas em diferentes momentos da pesquisa, os parâmetros bioquímicos (glicemia, triglicerídeos e LDL-c) e metabólicos mudaram de forma positiva, mesmo os resultados se apresentando adequados desde o primeiro momento do estudo (MEDEIROS et al., 2021), mostrando o potencial efeito da alimentação sobre o risco cardiovascular nesta população.

Deresz et al. (2018), avaliaram o padrão alimentar e a presença de fatores de risco para DCV em adultos vivendo com HIV/AIDS em um serviço de referência na região metropolitana de Porto Alegre, Rio Grande do Sul. Usando o QFA, os pesquisadores mensuraram a frequência de consumo de alimentos protetores e não protetores das DCV através de escores de frequência de consumo. A amostra apresentou maior consumo de alimentos de risco para DCV, demonstrou elevada prevalência de síndrome metabólica (35,6%) deflagrada pelos elevados índices triglicerídeos, baixo HDL-c e obesidade abdominal (DERESZ et al., 2018).

Apesar disso, são escassos os estudos que descrevem o padrão

alimentar e que compararam, de forma direta, as suas características aos fatores de risco cardiovasculares em crianças e adolescentes que vivem com HIV (FORTUNY et al., 2015; SONEGO et al., 2016), como avaliação do perfil lipídico, glicêmico e de gordura corporal de forma conjunta, além de não ter sido identificado, até o momento, o método de avaliação da ingestão alimentar pelos escores de consumo alimentar em nenhum desses estudos, principalmente análises com dieta de perfil protetor e/ou preditor do risco cardiovascular, o que torna importante o desenvolvimento deste estudo.

Técnicas de análise do padrão de consumo alimentar em grupos populacionais são muito utilizadas para estimar o risco de DCNT, proporcionando uma avaliação qualitativa sobre o potencial da alimentação nessas ocasiões. Contudo, o método de examinação da frequência de consumo alimentar, segundo escores de consumo, pode ser um instrumento bastante útil para verificação de dietas com potencial preditor do risco cardiovascular, principalmente por permitir a categorização dos alimentos segundo sua contribuição para risco de DCV (SILVA et al., 2010). Através do método dos escores de consumo alimentar, é aplicada uma pontuação aos alimentos presentes na dieta dos indivíduos, considerando a frequência de consumo deles. Dessa forma, quanto maior o escore de consumo, maior foi a ingestão de determinado grupo alimentar (AZEVEDO et al., 2014; FORNÉS et al., 2002).

Dessa maneira, o presente estudo se destina a investigar o grupo de adolescentes com intuito de estudar um padrão mais específico de dieta, além de trabalhar com uma populção com processo de crescimento e desenvolvimento mais definido. Assim, contribuirá com a identificação do efeito do padrão alimentar sobre os parâmetros de risco cardiovasculares segundo o método de escores, auxiliando no esclarecimento dos escores de alimentação relacionados aos fatores preditores e de proteção do desenvolvimento de DCV de adolescentes que vivem com HIV. Dessa maneira, será possível traçar estratégias nutricionais e ações de saúde pública mais eficazes, além de melhorar a qualidade de vida desse público.

Com base no exposto, a presente dissertação pretende avaliar os fatores de risco cardiovasculares em padrões de frequência de consumo alimentar,

em revisão sistermática e em campo, segundo o método dos escores, em adolescentes que vivem com HIV assistidos em hospital de referência no estado de Alagoas.

Tendo como objetivos específicos: 1) descrever o consumo alimentar de adolescentes alagoanos que vivem com HIV; 2) caracterizar os fatores de risco cardiovasculares, como perímetro da cintura, percentual de gordura corporal, pressão arterial, colesterol total, triglicerídeos, LDL-c, HDL-c e glicemia; 3) Comparar os escores de padrão alimentar dos grupos de alimentos preditores e protetores do risco cardiovascular segundo os seus fatores de risco; 4) sumarizar a literatura científica sobre o consumo alimentar e o risco cardiovascular em crianças e adolescentes que vivem com HIV, a partir de revisão sistemática.

2 REVISÃO DA LITERATURA

2 REVISÃO DA LITERATURA

2.1 INFECÇÃO DO HIV EM ADOLESCENTES (ASPECTOS EPIDEMIOLÓGICOS, FORMAS DE TRANSMISSÃO, SINAIS CLÍNICOS E TRATAMENTO)

Dentre os anos de 2007 até junho de 2020, o Sistema de Informação de Agravos de Notificação (SISVAN) registrou 342.029 casos de infecção pelo HIV no Brasil, sendo 20.283 casos de HIV em indivíduos de 10 a 19 anos de idade, mostrando um aumento em todas as regiões do país. No Nordeste, foram notificados, nesse mesmo período, 30.943 dos casos de HIV. No estado de Alagoas, o panorama de HIV entre 2007 e 2020 foi de 4.453 casos (BRASIL, 2020). Apesar da diminuição de casos de HIV em crianças e adolescentes entre os anos de 2009 e 2019, a quantidade de casos ainda é alarmante e não atinge o propósito da Organização Mundial da Saúde (OMS) (LINO; FERREIRA; RIBAS, 2021).

A aquisição da infecção pelo vírus do HIV pode ocorrer através da relação sexual sem o uso de preservativos, pela transmissão vertical (de mãe para filho) e por meio do uso de drogas injetáveis compartilhadas. A taxa de infecção pelo HIV em adolescentes é de três a seis vezes maior no sexo feminino do que no sexo masculino, devido ao estabelecimento de relação sexual das mulheres mais jovens com homens mais velhos (SIMON; HO; KARIM, 2006). Essa doença é um dos maiores problemas de saúde pública devido a sua característica pandêmica e sua gravidade. Seu principal aspecto está ligado à supressão do sistema imune que resulta em diversas doenças oportunistas e de forma mais letal, no óbito (LAZZAROTTO; DERESZ; SPRINZ, 2010).

O HIV é um lentivírus que pode ocasionar a síndrome da imunodeficiência adquirida (AIDS) (NETO et al., 2021). O ciclo do HIV é complexo, mas já é bastante estabelecido que o vírus invade as células do hospedeiro e ocasiona uma cascata de reações celulares que facilitam a replicação viral, ao mesmo tempo que se escondem dos diferentes componentes imunológicos. Nesses casos, a patogênese principal é a de transcriptase reversa e a capacidade de recombinar (SIMON; HO; KARIM, 2006). Esse vírus infecta, dentre tantos outros, os linfócitos T CD4+, os macrófagos e as células dendríticas, resultando na diminuição dessas células e do mecanismo de defesa do organismo (NETO et

al., 2021).

Por deixar o sistema imunológico comprometido, a infecção por HIV está correlacionada com infecções bacterianas e virais graves, problemas gastrointestinais, pneumonia, retardo de crescimento, entre outros (LOWENTHAL et al.,2014). Além disso, a população que vive com HIV possui uma ativação crônica do sistema imunológico, o que resulta em marcadores inflamatórios elevados de forma contínua, alguns dos quais estão inter-relacionados com episódio aterosclerótico (NOU; HADIGAN; GRINSPOON, 2016).

O HIV é responsável por manter níveis aumentados no plasma de marcadores de inflamação e coagulação, como, por exemplo, a proteína C reativa (PCR), Interleucina-6 e D-dímero. Estes, por sua vez, predizem eventos cardiometabólicos e a mortalidade. Além disso, a ativação de células T nessa doença estão relacionadas à progressão do HIV e a alterações em nível microvascular, levando à disfunção endotelial. A alta carga viral e os baixos níveis de células T CD4+ também exacerbam esses fatores de risco. Logo, as anormalidades do sistema imunológico são a base do risco de desenvolvimento das DCV associado ao HIV. As mais fatais entre elas são o infarto agudo do miocárdio e o acidente vascular cerebral (HSUE; WATERS, 2019).

O tratamento medicamentoso ocorre a partir dos antirretrovirais que possuem, dentre seu maior objetivo, a supressão viral, fazendo assim com que ocorra uma diminuição da morbidade e mortalidade dos indivíduos que vivem com HIV (LOWENTHAL et al.,2014). Esses medicamentos atuam sobre no processo de transcriptase reversa ou na protease. Uma combinação entre três ou mais antirretrovirais é necessária para atingir esse propósito (SIMON; HO; KARIM, 2006). Nesse esquema, são utilizados dois inibidores de transcriptase reversa análogos de nucleosídeos ou nucleotídeo com um medicamento de outra classe que podem ser os inibidores de transcriptase reversa não análogos de nucleosídeos ou inibidores de protease reforçados com ritonavir ou inibidores de integrase (NETO et al., 2021).

Os pontos positivos da utilização desses fármacos superam os efeitos adversos nos pacientes imunossuprimidos, como a toxicidade (renal, hepato e mitocondrial) e as alterações metabólicas (lipodistrofia que predispõe a resistência insulina, dislipidemias e a doença coronariana) (SIMON; HO; KARIM,

2006). Porém, apesar das boas contribuições da TARV para a população que vive com HIV, a sua utilização associada às várias complicações da própria doença, é um forte contribuinte para o surgimento de DCV (NOU et al., 2016).

Alguns desses fármacos aumentam os níveis plasmáticos de LDL-c, outros induzem a hipertrigliceridemia, mas os inibidores de protease, principalmente com formulações antigas, possuem maiores efeitos nos riscos cardiovasculares e parecem estar relacionados com o aumento da absorção de colesterol no organismo. A inflamação vascular e a reatividade plaquetária são possíveis mecanismos advindos da exposição cumulativa a TARV que elevam os riscos cardiometabólicos, inclusive de infarto agudo do miocárdio (HSUE; WATERS, 2019).

Adolescentes com HIV muitas vezes apresentam déficit de crescimento com baixo peso para idade, baixo peso para altura e baixa altura para idade em comparação com os indivíduos saudáveis, devido a ativação crônica do processo de inflamação, desnutrição, infecções oportunistas, problemas gastrointestinais e anormalidades endócrinas. Esse risco se agrava quando a aquisição da doença ocorre no período perinatal e pode resultar em retardo do aparecimento da puberdade (LOWENTHAL et al.,2014; WILLIAMS; JESSON, 2018).

Além disso, a desnutrição em conjunto com a inflamação crônica; redução da insulina, como o fator de crescimento 1 (IGF-1); secreção alterada do hormônio de crescimento e da gonadotrofina, enfatizam ainda mais esse surgimento da puberdade de forma tardia (WILLIAMS; JESSON, 2018). O HIV também pode desenvolver alterações na composição corporal, com distribuição anormal de gordura corporal e diminuição de massa muscular (LIMA et al., 2017).

A literatura científica revela uma melhora do processo de crescimento e do ganho de peso em crianças e adolescentes que iniciam o tratamento com antirretroviral. Ademais, estudos indicam que o retardo do processo de puberdade relacionado ao HIV também pode contribuir com maiores riscos para o surgimento de alterações metabólicas (WILLIAMS; JESSON, 2018).

Apesar do tratamento com TARV ter resultado em aumento na sobrevida, esse ainda colaborou com o surgimento de DCNT, gerando grandes morbidades entre os indivíduos que o usam. Dentre as complicações do TARV as principais são lipodistrofia, hiperlipidemia, resistência à insulina, hipertensão e a obesidade

– destaque para a elevação da circunferência da cintura – devido ao acúmulo de gordura no tecido visceral e no epicárdio (ESPIAU et al., 2017; LOWENTHAL et al.,2014; NOU et al., 2016).

Dessa forma, a síndrome metabólica (SM) pode ser um fator agravante nesses casos, principalmente em crianças e adultos com HIV. Sendo assim, entre as DCNT comuns no HIV, as mais prevalentes são as DCV. O seu risco está atrelado tanto à infecção por HIV quanto pelo próprio advento dos antirretrovirais, resultando em aumento da aterosclerose subclínica nessa população (ESPIAU et al., 2017; NOU et al., 2016).

Nesse caso, a intervenção nutricional em pessoas vivendo com HIV é de suma importância, pois auxilia na preservação da massa magra, evita ou reverte os casos de desnutrição e obesidade, previne os efeitos colaterais da TARV e minimiza a piora do sistema imunológico, contribuindo com a melhora da qualidade de vida desses indivíduos (COURA; GUERRA; NERI, 2011).

2.2 CONSUMO ALIMENTAR E RISCO CARDIOVASCULAR EM ADOLESCENTES QUE VIVEM COM HIV

Embora a TARV tenha seus benefícios, inclusive sobre a diminuição da mortalidade nesse público, suas complicações associadas ao quadro clínico de inflamação crônica e ativação imunológica são fatores de risco para o surgimento de DCV. Além disso, estudos revelam que pessoas que vivem com HIV possuem hábitos alimentares inadequados, ou seja, caracterizados pelo alto consumo de alimentos ricos em ácidos graxos trans, cereais refinados e o baixo consumo de alimentos com alto teor de fibras e minerais, auxiliando no crescimento do risco cardiovascular nesse público (DERESZ et al., 2018).

As fibras alimentares, encontradas em frutas, legumes, verduras, cereais integrais, entre outros, são responsáveis por afetar o tempo de trânsito intestinal, retardando ou reduzindo assim a absorção de CHO e gorduras. Dessa forma, diminuem o risco de desenvolvimento de DCV (TRAUTWEIN; MCKAY, 2020). Já o consumo excessivo de CHO, principalmente os refinados (farináceos, amidos, xaropes de milho, açúcar de adição, etc.), ocasiona um desequilíbrio entre a oferta de lipídeos e outros nutrientes, aumentando os riscos de hipercolesterolemia e excesso de peso (BAYLÃO; ARAÚJO; FERREIRA, 2021;

CARDOSO, 2018).

Um dos mecanismos pelos quais as gorduras trans, encontradas principalmente em produtos de panificação, margarinas e outros industrializados, aumentam o risco cardiovascular está relacionada à supressão da atividade do LDL receptor, ocasionando maior acúmulo de LDL-c no plasma (BAYLÃO; ARAÚJO; FERREIRA, 2021; CHIARA et al., 2002). Por fim, as gorduras saturadas, presentes de forma abundante em carnes, leites e derivados, óleo de coco, etc., reduzem a atividade de receptores hepáticos de LDL, aumentam a atividade da ACAT hepática, induzindo o enriquecimento de colesterol éster em lipoproteínas ricas em apo B, elevam a triglicerídeos no sangue como resultado do estímulo da secreção hepática de lipoproteínas contendo apo B, entre outros (LOTTENBERG, 2009). Dessa maneira, foi descrita uma relação positiva entre a ingestão de gordura saturada e concentrações plasmáticas de LDL-c (HUNTER; ZHANG; KRIS-ETHERTON, 2010).

A literatura científica relata que indivíduos que vivem com HIV consomem mais gorduras totais e saturadas do que a população saudável. Além disso, é comprovada uma associação entre consumo de gordura saturada e perfil lipídico, mesmo com o controle dos fármacos inibidores de protease. Sendo assim, a ingestão elevada de gorduras saturadas colabora para o surgimento de hipertrigliceridemia entre pessoas que vivem com HIV e com problemas metabólicos. Ademais, também está descrito na literatura que a população que vive com HIV entre 20 a 59 anos, que ingeria lipídeos em maior quantidade possuía uma maior prevalência de obesidade central (TANAKA, 2012).

Pesquisas revelam que a alimentação de crianças e adolescentes brasileiras indicam inadequação de micronutrientes, excesso de ingestão de energia e alto consumo de alimentos ultraprocessados. Dessa mesma maneira ocorre no perfil alimentar de crianças e adolescentes vivendo com HIV (LINO; FERREIRA; RIBAS, 2021). Sendo os ultraprocessados produtos que apresentam maiores concentrações de gordura, açúcar e sódio do que alimentos *in natura*, minimamente processados e processados, logo, possuem fatores dietéticos associados a DCV, além de auxiliarem na instalação da deficiência de micronutrientes (CARDOSO, 2018).

No estudo de Werner et al. (2010) os resultados para a população acima de 9 anos são parecidos com os requisitos citados acima, sendo que há um

maior consumo de colesterol proveniente da ingestão elevada de alimentos ricos em colesterol e gordura saturada. Ademais, o consumo de fibras alimentares está abaixo do recomendado para a idade, o que auxilia ainda mais na elevação do colesterol sérico. Entretanto, o consumo alimentar nas alterações metabólicas devido ao HIV ainda é pouco explorado no Brasil. Como o risco de DCV já se inicia na infância, as mudanças no padrão alimentar e de estilo de vida são recursos essenciais para o tratamento deles (WERNER et al., 2010).

Dados científicos descrevem que a substituição do consumo de ácidos graxos saturados por gorduras monoinsaturadas, poliinsaturadas e CHO integrais está relacionada ao menor risco cardiovascular. Esses nutrientes também são responsáveis por melhorar a resposta glicêmica e a resistência à insulina. Nesse intuito, as diretrizes dietéticas recomendam a ingestão de uma dieta baseada em vegetais e menos alimentos de origem animal. Ofertando assim, menos gorduras saturadas e trans, mais lipídios insaturados, proteínas, fibras, micronutrientes (vitaminas e minerais) e fitonutrientes (TRAUTWEIN; MCKAY, 2020).

Por fim, a OMS aconselha que as condutas voltadas para o estilo de vida saudável, como os aconselhamentos nutricionais, estejam presentes nos programas de controle e tratamento da AIDS, pois essa técnica pode diminuir as anormalidades metabólicas nesses indivíduos. Devido a existência de poucos estudos associando alterações metabólicas e dietéticas em crianças e adolescentes como consequência do HIV e da utilização da TARV, faz-se necessário o desenvolvimento de mais estudos nessa área, principalmente corroborando com a importância da educação nutricional como um dos recursos terapêuticos. Por fim, a alimentação é um fator modificável que pode mudar o risco metabólico de crianças e adolescentes que vivem com HIV/AIDS (SCHMITZ et al., 2018).

2.3 PROTOCOLO E REVISÃO SISTEMÁTICA

Foi realizado um protocolo (APÊNDICE A) e uma revisão sistemática com o intuito de explorar as evidências científicas publicadas sobre consumo alimentar e risco cardiovascular em crianças e adolescentes vivendo com HIV para servir de base para a compreensão dos fundamentos que norteiam a abordagem desse objetivo de estudo.

2 COLETÂNEA DE ARTIGOS:

1º ARTIGO

JESUS, M. H. T.; SILVA; M. S. M.; ANDRADE, M. I. S.; LIMA, L. R. A. Consumo alimentar e risco cardiovascular em crianças e adolescentes que vivem com HIV: uma revisão sistemática de estudos observacionais. Public Health Nutrition (Qualis A1, Segundo os critérios do Sistema Qualis CAPES/Área de Nutrição).

Food consumption and cardiovascular risk in children and adolescents living with HIV: a svstematic review of observational studies

Consumo alimentar e fatores de risco cardiovasculares em crianças e adolescentes que vivem com HIV: uma revisão sistemática de estudos

Monyque Hellen Teixeira de Jesus[1]
Maria Sidiane Marques da Silva[2]
Maria Izabel Siqueira de Andrade[2]
Luiz Rodrigo Augustemak de Lima[1,3]

Abstract

The aim of this review was to summarize the dietary intake of children and adolescents living with the human immunodeficiency virus (HIV) and the association with cardiovascular risk factors. PubMed/MEDLINE, Scopus, Web of Science, BIREME and LILACS were consulted in search of original observational studies, in addition to the manual search of references, between June and August 2021. We identified 1,114 studies, only 12 studies met the inclusion criteria were considered for analysis. A total of eleven studies involving 1,805 participants were included from 6.5 to 17.3 years Energy consumption above the recommendations was identified in 4 of 12 (33.3%) studies, intake meet the recommendations for carbohydrates was present in 6 out of 12 (50%), for proteins in 6 out of 12 (50%) and for lipids in 3 out of 12 (25%). Inadequate intake of fiber and micronutrients was present in 7 out of 12 (58.3%) and 4 out of 12 (33.3%), respectively. A dietary pattern of low consumption of fruits and vegetables or low consumption of fiber were observed in 9 out of 12 studies (75%). The association between energy intake; lower sugar and fat intake and presence of lipodystrophy syndrome in 1 of 12 studies (8.3%); fat intake and plasma lipid levels in 1 of 12 studies (8.3%); lower fiber intake higher z-score values for BMI in 1 of 12 studies (8.3%); positive correlation between cholesterol intake and plasma triglyceride levels in 1 of 12 studies (8.3%). We conclude that

Correspondence
Luiz Rodrigo Augustemak de Lima. Postgraduate Program in Nutrition, Federal University of Alagoas, Campus A.C. Simões. Maceió-AL, Av. Lourival Melo Mota, S/N, Tabuleiro do Martins, CEP: 57072-970, Brazil. Email: luiz.lima@iefe.ufal.br

[1]Postgraduate Program in Nutrition (PPGNUT), Federal University of Alagoas (UFAL). Maceió, Alagoas, Brazil
[2] Faculty of Nutrition, Federal University of Alagoas (UFAL). Maceió, Alagoas, Brazil
[3]Institute of Physical Education and Sports (IEFE), Federal University of Alagoas (UFAL). Maceió, Alagoas, Brazil

there an inadequate consumption of energy, fiber and micronutrients was reported in HIV-infected adolescents. In addition to a dietary pattern of low fruit and vegetable consumption. Few studies reported associations between food intake and cardiovascular risk factors. Thus, there is a need for nutritional guidance strategies aimed at changing inappropriate eating habits, helping to reduce cardiovascular risk factors in this public.

Key-terms: Human immunodeficiency virus; Food intake; Cardiovascular diseases; Adolescent; Youth

Introduction

Antiretroviral therapy (ART) has made it possible to increase the survival of people infected with HIV (1). In children and adolescents, the decreases HIV replication and increases the amount of lymphocyte T CD4+ cells, promote the growth and development of these individuals (2). On the other hand, chronic immune activation due to HIV infection, even at undetectable levels, combined to long-term exposure to ART, was associated with dyslipidemia, insulin resistance and chronic low-grade inflammation that exacerbate cardiovascular risk factors (1, 3).

The concern lies with the process of nutritional transition (4) and the search for practical foods, most of which are ultra-processed, rich in sugar, fat and salt, which increase the risk of chronic non-communicable diseases (4, 5). In this sense, a diet rich in processed foods and its positive association with cardiovascular risk factors (high total cholesterol and LDL-c and low HDL-c) due to the prevalence of consumption of saturated and trans-fat, as well as sodium and refined carbohydrate (6, 7).

Although studies have shown that dietary intake is similar in HIV-infected children and adolescents compared to healthy controls (8, 9), the risks of developing cardiovascular disease at an early age are higher in pediatric patients living with HIV, demonstrating the need to examine and summarize the food consumption of this population.

Medeiros et al. (10) identified inadequate consumption of micronutrients in children and adolescents with HIV. Nutrients found more abundantly in fresh and minimally processed foods and which have a fundamental antioxidant role in improving the immune system (10), which is important for this population. On the other hand, there is evidence of excessive intake of added sugars in the diet of children and adolescents living with HIV (9). Thus, it can be assumed that the coexistence of inadequate food consumption may be associated with cardiovascular risk factors, previously observed between food consumption and lipodystrophy syndrome (11) and between intake of trans-fats and low density lipoprotein cholesterol (LDL-c) (12). The assessment of food consumption is important because it has great potential to influence the levels of lipids and other biomarkers that express cardiovascular risk, this is added to the deleterious effects of ART and HIV itself. Therefore, it can be said that there may be a strong

correlation between food consumption and cardiovascular risk factors, which may culminate in premature atherosclerosis (9, 13, 14).

Conversely, studies with adults and adolescents living with HIV did not find an consistent association between the consumption of "protective foods" (fruits and natural juices, vegetables, legumes, whole grains, among others) and "non-protective" (products whole dairy products, vegetable and animal fats, fried foods, sausages, etc.) with cardiovascular risk factors (15).

Information on food consumption represents an important resource for identifying and characterizing the dietary pattern as a potential predictor or protector of cardiovascular risk. Summarizing the available evidence may support guidance strategies aimed at changing inappropriate eating habits towards a healthy pattern that can improve the immune system and reduce cardiovascular risk factors in children and adolescents living with HIV. Moreover, nutritional interventions to address chronic disease and HIV are need(16).

The objective of this systematic review was to summarize the evidence of food consumption by children and adolescents living with HIV, in addition to the association of this consumption with cardiovascular risk factors.

Methods

Data sources and literature search

This review was conducted in accordance with the *Preferred Reporting Items* for systematic reviews and meta-analyses (PRISMA) (17) from observational studies (case-control, cross-sectional, and cohorts [both prospective and retrospective]) who evaluated dietary intake and association with cardiovascular risk in children and adolescents diagnosed with HIV. The protocol for this review was registered on the digital platform *International Prospective Register of Systematic Reviews* (PROSPERO®) in June 2021 under number CRD42021254856.

The exposure considered was food consumption analyzed by quantitative (energy, macronutrients and micronutrients) and qualitative approaches (refined carbohydrates, lipids, saturated and trans-fat, degree of food processing).

Primary outcomes of our interest were based on cardiovascular risk factors and included dyslipidemia (i.e. total cholesterol and fractions, triglycerides) dysglycemia (i.e. insulin, HOMA-IR, glucose), body fat abnormalities

(anthropometric indicators [i.e. BMI/age and waist circumference], body fat percentage and lipodystrophy), vascular abnormalities (i.e. systolic and diastolic blood pressure, arterial stiffness, and carotid intima-media thickness).

Searches were conducted in PubMed/MEDLINE, Web of Science, LILACS and, Scopus between July 2021 and August 2021 and original articles published in Portuguese, English, and Spanish were considered for review. The search strategy considered words identified from the Medical Subheadings (MESh) and corresponding to the strategy PECOS available in table 1 (supplementary material).

Eligibility criteria

The following were considered eligibility criteria: 1) original observational studies; 2) studies in children and adolescents diagnosed with HIV and aged between one and twenty years, in clinical follow-up independent of the ART type. Exclusion criteria: 1) studies in languages other than Portuguese, Spanish and English; 2) sample with other comorbidities, such as non-AIDS wasting diseases, chromosomal abnormalities, neurological diseases (paralysis), among others; 3) studies that evaluated enteral and parenteral nutritional therapy; 4) studies with pregnant adolescent.

Selection Process and Data Extraction

The original studies found in the databases were downloaded and entered into bibliographic management software (EndNote X9®) to exclude duplicate studies. Subsequently, these studies were checked for eligibility criteria by two independent researchers (MHTJ, MSMS) by two phases process: 1) reading titles and abstracts and 2) reading the full-text for inclusion or exclusion in this review. The data extraction process was performed in Rayyan® by two researchers (MHTJ, MSMS) and validated by at least one experienced researcher (MISA, LRAL). Potential studies that had not been identified by the database search strategy were manually included in this review.

The data extracted from the original studies was organized in spreadsheets according to 1) the characterization of the sample (author, country, year, type of study, age, and proportions), 2) exposures (food consumption expressed in energy and nutrient intake, frequencies, patterns or scores), 3)

Supplementary table 1

Description of the PECOS strategy used for the systematic review.

	KEYWORDS
P (problem/patient)	HIV OR human immunodeficiency virus OR acquired immune deficiency syndrome virus OR AIDS OR HIV-1 OR HIV infections OR AIDS arteritis, central nervous system
E (exhibition)	Food consumption OR food intake OR dietary intake OR diet mediterranean OR diet atherogenic OR dietary pattern OR nutrients OR antioxidants OR macronutrient intake OR micronutrient intake
C (control/comparison)	not applicable
O (outcome)	Cardiovascular diseases OR disease risk factors OR vascular diseases OR atherosclerosis OR arteriosclerosis OR cardiovascular risk factors OR carotid intima-media thickness OR nutritional and metabolic diseases OR lipid metabolism disorders OR metabolic diseases OR glucose metabolism disorders OR insulin resistance OR diabetes mellitus OR hyperglycemia OR metabolic syndrome OR cardio metabolic syndrome OR blood pressure OR systolic pressure OR diastolic pressure OR glucose metabolism disorders OR insulin resistance OR hypertension OR high blood pressure OR adipose tissue OR fat body OR body fat distribution OR subcutaneous fat OR abdominal fat OR subcutaneous OR abdominal fat OR subcutaneous OR lipodystrophy OR HIV-associated lipodystrophy syndrome OR HIV lipodystrophy syndrome OR intra-abdominal fat OR obesity OR visceral fat OR overweight OR obesity, abdominal OR pedriatic obesity OR hypercholesterolemia OR hypertriglyceridemia
S (studies)	not applicable

outcomes (cardiovascular risk factors and the variables that express them), and secondary analyzes of interest in this study.

Data analysis

To characterize the studies, the following were extracted: author, year of publication, title, objective, type of study, sample size, place where the research was carried out, age group, age, exposure to ART, sex, T CD4+ lymphocytes, viral load, method of evaluation and analysis of food consumption, software used for evaluation and the results (qualitative, quantitative, energy, macro and micronutrients) with the association with cardiovascular risk factors (dyslipidemia, dysglycemia, body fat abnormalities and vascular abnormalities).

Risk of bias assessment

It was performed by two independent researchers (MHTJ, MSMS) using the Quality Assessment Tool of the National Heart, Lung and Blood Institute for Observational and Cross-Sectional Studies. Disagreements between researchers were discussed and, when necessary, a third researcher was consulted (MISA, LRAL). The questions were answered with “no” and “yes”, assigning a score of 0 and 1, respectively. The arithmetic mean of valid questions was obtained to calculate the final score. The risk of bias score was classified as low (score ≥ 0.70), moderate (≥ 0.50-0.69) and high (< 0.50).

RESULTS

The electronic search resulted in 1,114 studies for analysis. Of these, 120 duplicates were excluded in the EndNote X9® program, 99 of which were included in the Rayyan® digital platform for analysis of titles and abstracts. After this step, 124 were selected for reading the full text. Considering the eligibility criteria, eight works were included from the databases and four were added manually. Figure 1 shows the study selection flowchart.

Characteristics of the participants

Five studies were developed in Brazil (11, 18-21), three in the United States of America (8, 12, 22), one in El Salvador (23), one in South Africa (9), one in India (24) and one in Portugal (25). The sample study ranged from 40 to

440 individuals aged between one and twenty years. The proportion of female subjects represented 40% to 70% of the sample in the studies. Vertical HIV transmission occurred in 64% to 100% of the participants, only two studies described sexual transmission, blood transfusion or unknown cause (8, 23). Three studies did not report information on the mode of transmission (18, 20, 22). Viral load ranged from undetectable in nine studies (9, 11, 12, 18-20, 22-24) and detectable in nine studies with values up to 436,000 copies/ml (9, 11, 12, 18-20, 22-24, 26). Three studies did not report patients' viral load (8, 21, 25). T CD4 lymphocytes varied between 8.3% and 50%, with patients with lymphocytes T CD4 greater than or equal to 25% - identified in four studies (9, 11, 18, 25), between 15-24% was found in five (8, 11, 22, 24, 25) e <15% and less than 15% (severe immunosuppression) was described in four studies (11, 22, 24, 25, 27). Table 1 presents the characteristics of the studies and their participants.

Food consumption analysis methods

Six out of twelve studies (50%) used the 24-hour recall (8, 11, 12, 21, 22, 25). Shiau et al. (9) and Martín-Cañavate et al. (23) used the 24-hour recall and the food frequency questionnaire (FFQ). Hillesheim et al. (18), Werner et al. (19) and Tremeschin et al. (20) used the FFQ and Padmapriyadarsini et al. (2018) (24) applied the 24-hour recall and food insecurity questionnaire.

For the interpretation of consumption, ten of twelve studies (83.3%) used the adequacy of food intake according to dietary reference recommendations (DRIs), but one (8.3%) used principal component analysis, identifying three patterns dietary: 1) ''healthy diet'': high consumption of fruits, vegetables, dairy products and the meat group (meat and fish); 2) ''high fat and sugar'': high intake of eggs, meat, oils, fats and the miscellaneous group; 3) ''low dietary diversity'': high consumption of cereals and legumes (23) and another study (8.3%) used the diet quality index (21).

Food consumption of adolescents living with HIV

Within the studies selected for this review, 12 of 12 (100%) reported food consumption, 9 of 12 described energy intake (75%), 6 of 12 carbohydrate consumption (50%), 6 of 12 protein intake (50%), 7 out of 12 lipid intake (58.3%), 6 out of 12 dietary fiber intake (50%) and 6 out of 12 micronutrient intake (50%).

Figure 1

Study selection flowchart.

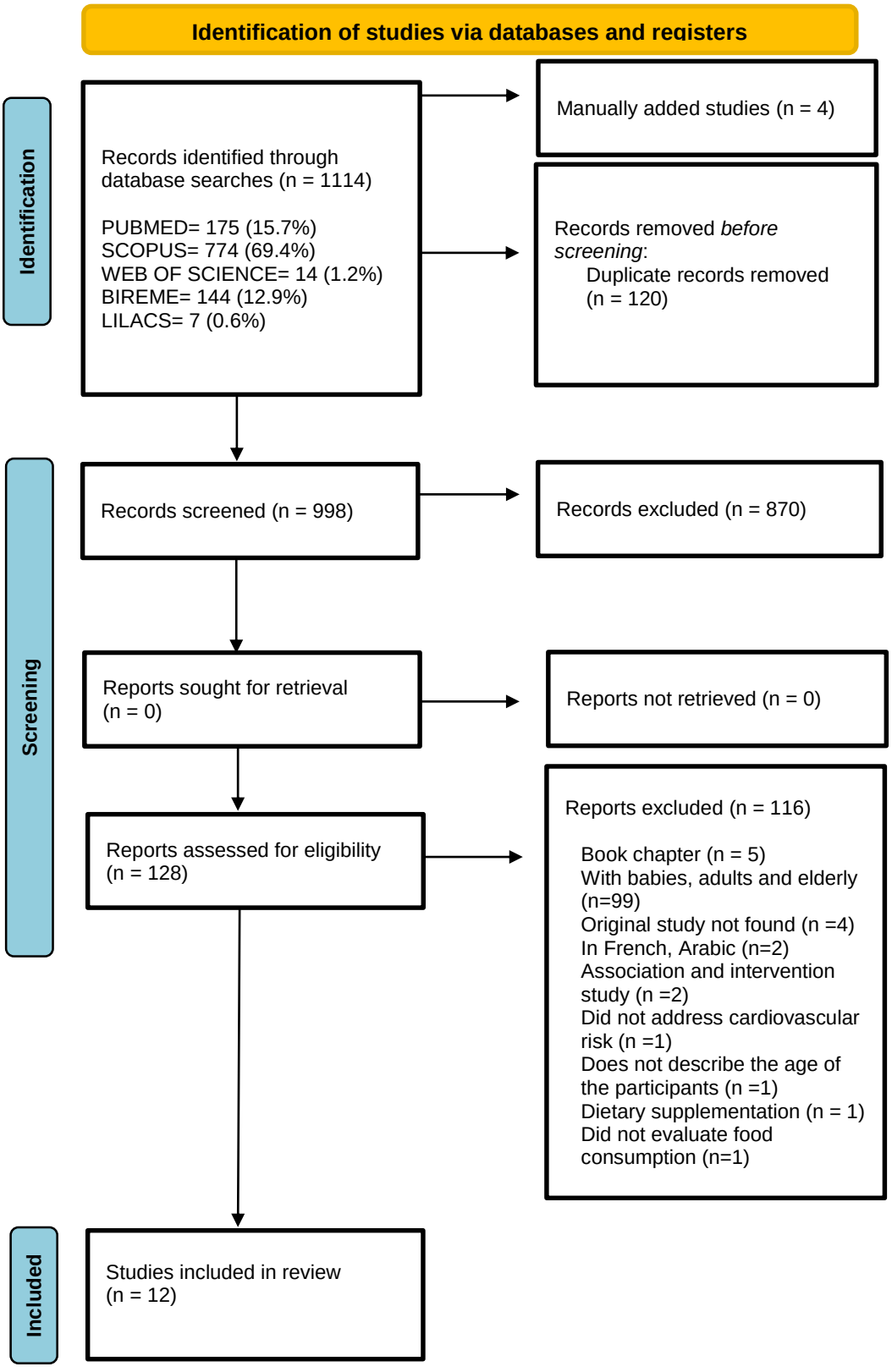

Table 2 summarizes the results for energy, carbohydrates, dietary fiber, proteins, lipids and micronutrients and their respective adequacy according to the DRIs.

Comparative study of HIV-infected adolescents with a control group (9) showed higher consumption of carbohydrate-rich foods (53% vs. 50%, p = 0.012), slightly lower energy intake from lipids (29.8% vs. 31.8%, p = 0.043), which was not significant for proteins (12.9% vs. 13.5%, p = 0.130).

Adolescents living with HIV showed a higher intake of foods rich in saturated fat (33% vs. 30.8%, p = 0.020) and trans-fats (2.7% vs. 2.3%, p = 0.048). Shiau et al. (9), reported no differences between groups for cholesterol intake. About 33% of adolescents living with HIV in this study exceeded the WHO recommendations for sugar intake.

In Werner et al. (19) cholesterol consumption was found to be above 300 mg/day, which is higher than the recommendation (28). Hilliesheim et al. (18) reported values above 200mg/day in 57.1% of the population and Sharma et al. (8) identified that female cholesterol intake remained below the Department of Agriculture Guideline (USDA), in addition to a high consumption of sugary drinks (soft drinks).

Adolescents living with HIV had a daily sodium intake above the recommended in 236% and 99% had sodium intake above the recommendations (12). In Martín-Cañavate et al. (23), almost all children consumed cereals daily and 86% consumed legumes three or more times a week. However, only 61%, 28% and 32% consumed fruits, vegetables and dairy products daily, respectively. Still, 63% reported consuming eggs three times a week or more, fish and meat was evenly split between three times a week or more (44%).

Sweets, soft drinks, sugar, pizza and chocolate were consumed by 84% of the children more than three times a day. Children with high adherence to a healthy diet consumed more meat, milk, cheese and a diversified intake of cereals. In contrast, children with high adherence to a high-fat/sugar diet consumed more eggs, sweets, sugar, and cocoa/coffee drinks (23).

In the "low dietary diversity" group, food intake was not as monotonous. Less than 1/3 of children consumed vegetables daily and about half consumed dairy products daily. More than 2/3 consumed unhealthy foods every day. There was a high consumption of carbonated and low-nutrient beverages. At least 10%

Table 1

Characteristics of the studies included in the systematic review.

Author	Year	Study design	n	Country	Age range	Age, mean (SD)	Female, n (%)
Arpadi et al.(22)	2000	Cross-Seccional	42	United States	NR	6,5 (1,8): without growth deficiency 8,3 (2,4): with growth deficiency	24 (57.1)
Tremeschin et al.(20)	2007	Cross-Seccional	40	Brazil	NR	7,85 (1,70)	8 (40)
Sharma et al.(8)	2008	Prospective Cohort	116	United States	3 to 20 years	6,6[a]: Boston 8,5[a]: Rochester	67 (57.7)
Werner et al.(19)	2010	Cross-Seccional	43	Brazil	2 to 16 years	6,70 (2,05): child 13,21 (1,81): adolescents	21 (48.8)
Hillesheim et al.(18)	2014	Cross-Seccional	49	Brazil	7 to 17 years	12,6 (2,7)	24 (49)
Papi et al.(11)	2014	Cross-Seccional	90	Brazil	2 years or more	10,6	52 (58)
Ziegler et al.(12)	2014	Prospective Cohort	218	United States	1 to 25 years	17,44 (4,79)	81 (46.3)
Tanaka et al.(21)	2015	Cross-Seccional	88	Brazil	10 to 19 years	27.3 %[b]: 10 to 13 years 37.5%[b]: 13 to 6 years 35.2%[b]: 16 to 20 years	45 (54.5)
Shiau et al.(9)	2017	Cross-Seccional	440	South Africa	5 to 9 years	6,7 (1,4)	212 (48.2)
Padmapriyadarsini et al.(24)	2018	Longitudinal	390	India	2 to 12 years	8 (3)	191 (48.9)
Martín-Cañavate et al.(23)	2018	Cross-Seccional	307	El Salvador	2 to 18 years	9,6 (0,2)	146 (47.6)
Martins et al.(25)	2021	Cross-Seccional	31	Portugal	7 to 19 years	14,1 (3,5)	NR

[a]: median; [b]percentage; NR: not reported.

were overweight or obese (23).

Food consumption and cardiovascular risk factors

Within the studies selected for this review, 12 out of 12 (100%) reported food consumption, with only 6 out of 12 (50%) articles addressing food intake and cardiovascular risk factors simultaneously. Table 2 summarizes the dietary intake for energy, carbohydrates, proteins, lipids, dietary fiber and micronutrients and their respective adequacy according to the DRIs, and Table 3 characterizes the dietary intake of children and adolescents with HIV in the included studies, in addition to the association with the cardiovascular risk factors.

The studies considered the following variables in the assessment of cardiovascular risk: BMI, peripheral lipodystrophy, centripetal or mixed lipohypertrophy, skinfolds (triceps, subscapular, brachial, suprailiac), waist circumference, fat mass evaluated by electrical bioimpedance, body fat percentage, total cholesterol, triglycerides, glucose, serum insulin, HDL-c, LDL-c and C-reactive protein.

Among the studies that evaluated cardiovascular risk factors simultaneously with food consumption (6 out of 12; 50%) (11, 12, 21, 22, 24, 25), only 2 out of 6 described associations of dyslipidemia with food consumption (12, 24). Padmapriyadarsini et al. (24) found, among girls older than 9 years, that lipid intake was significantly higher in those with high serum triglycerides compared to other patients with normal serum levels ($p = 0.04$). In the same study, dyslipidemia was present in 40% and insulin resistance in 17%, but no other significant associations were found between dietary intake of macronutrients and lipid profile.

Papi et al. (11) highlighted that the low quality of the diet linked to the inadequate consumption of vegetables and fruits ($p=0.02$), in addition to sugar and fats ($p= < 0.01$) were associated with the presence of lipodystrophy syndrome. Being evaluated through laboratory tests (dyslipidemia), physical examination and anthropometry. Furthermore, in this study, 88.3% of the patients had dyslipidemia, with 46 of the adolescents having lipodystrophy syndrome, 22% having lipoatrophy and 32% lipohypertrophy.

In the study of Arpadi et al. (22), a significant inverse relationship was identified between energy intake and fat-free mass ($p= <0.001$), the BMI variable

Table 2

Summary of results for energy, carbohydrates, dietary fiber, proteins, lipids and micronutrients and their respective suitability according to DRIs.

STUDIES	NUTRIENTS					FIBRAS
	ENERGY	CARBOHYDRATES	PROTEINS	LIPIDS	MICRONUTRIENTS	
Arpadi et al.(22)	Growth deficit ↓	✗	✗	✗	✗	✗
Tremeschin et al.(20)	✓	✓	✓	✓	✓	✗
Sharma et al.(8)	↑	4 to 18 years ✓	4 to 18 years ✓	Female 4 to 18 years ✓	✗	↓
Werner et al.(19)	↑	3 to 8 years ↑	✗	3 to 8 years ↓	✗	> 9 years ↓
Hillesheim et al.(18)	↑	✓	✓	↓	↓	↓
Papi et al.(11)	✗	✗	✗	✗	✗	✗
Ziegler et al.(12)	✗	✓	✓	HIV ↑	HIV ↓	↓
Tanaka et al.(21)	✗	✗	✗	✗	✗	✗
Shiau et al.(9)	✓	↓	↓	↓	↓	↓
Padmapriyadarsini et al.(24)	< 4 years ↓	✗	✗	✓	↓	✗
	≥ 4 years ✓					
Martín-Cañavate et al.(23)	✗	✗	✗	✗	✗	✗
Martins et al.(25)	↑	✗	↑	✗	↓	↓

↓ Below recommendations DRIs; ✓ Within the recommendations DRIs; ↑ Above recommendations DRIs; ✗ Did not report.

was included, but did not obtain significant results. Mean age-adjusted body fat percentage did not differ significantly between children living with HIV with and without growth deficiency (19.8±8.2 vs. 19.1±8.4%).

Martins et al. (25) pointed out that the consumption of foods rich in protein, sugar and sodium were high in their study, considering the estimated average needs. At least 25% of the adolescents had a z-score for overweight BMI. In the same study, the prevalence of lipodystrophy was 32.2%. Furthermore, higher BMI z-score values were associated with lower fiber intake values (p=0.006).

In Ziegler et al. (12), in both HIV and healthy control groups, there was a greater contribution of energy from saturated and trans-fat, but normal cholesterol intake. Also in the HIV group, there was a positive correlation between trans-fat intake and plasma LDL-c (p=0.04), as well as fiber intake and plasma triglycerides (p=0.04). A negative correlation was observed between total fat intake and plasma triglycerides (p=0.02).

Tanaka et al. (21) for this study, the diet quality index score of adolescents living with HIV was low (51.90 out of 100), was found a higher proportion of the maximum score for food consumption of oils (84.1%), followed by total cereals (83.0%), vegetables and vegetables of orange and dark green (79.6%). On the other hand, the lowest averages were found in whole grains, sodium, whole fruits and calories of solid fats, alcoholic beverages and added sugars. The components with the highest minimum score ratio (zero) were sodium (86.4%) and whole grains (72.7%). Finally, inadequate intake of fruit and sodium was found.

Two significant differences in the site of residence analyses: higher average fruit consumption (p = 0.015) and lower averages of consumption of meat and beans (p = 0.026) among adolescents who live in orphanages in a comparison to those who live with their families. This study did not identify a statistically significant association between the mean score of the diet quality index and waist circumference (p=0.115)(21).

The association between nutritional status and adherence to dietary patterns were explored and no significant results were obtained (23). No research presented vascular variables associated with food consumption.

Risk of bias analysis

Regarding the evaluation of risk of bias of studies in this review, the score ranged from 0.42 (high risk of bias), 0.50 (moderate risk of bias) to 0.70 (low risk of bias), of which three studies showed low risk of bias (18, 19, 23) while eight studies showed moderate risk (8, 9, 11, 21, 22, 24, 25, 29) and one showed a high risk (12). Some items (i.e., follow-up rate of individuals included) were not evaluated due to the design of studies included in this review (Table 4).

Discussion

This review aimed to evaluate the dietary intake of children and adolescents living with HIV and its association with cardiovascular risk factors. The major findings on food consumption were: 1) energy intake above recommendations; 2) intake meet the recommendations for carbohydrates, proteins and lipids (below the recommendations in the same proportion); 3) inadequate intake of fiber and micronutrients; 4) inadequate consumption of fruits and vegetables.

Finding on food consumption with cardiovascular risk were available in 6 out 12 studies, and include: 1) significant inverse relationship between energy intake and fat-free mass; 2) sugar and fat intake was significantly associated with lipodystrophy syndrome; 3) inadequate intake of vegetables and fruits was significantly associated with lipodystrophy syndrome; 4) mean HDL-c significantly lower and triglycerides significantly higher in the HIV-infected group. Significant difference between intake of trans fats and plasma LDL-c, fiber intake and plasma triglycerides. Negative correlation between fat intake and triglycerides; 5) significant association between macronutrient intake and serum lipid levels in girls over 9 years of age. Girls with increased serum triglycerides: higher fat intake compared to peers with normal triglyceride levels; 6) higher BMI z-score associated with lower fiber intake; dyslipidemia associated with in total cholesterol intake, triglycerides, LDL-c and HDL-c; 7) presence of abnormalities in body fat (lipoatrophy and lipohyperatrophy).

Sharma et al. (8) identified that the food intake of children and adolescents with HIV is similar to that of healthy individuals. This information was also verified by Tremeschin et al. (29), in which they reported an evolution in the concern about the nutritional status of children and adolescents with HIV, evolving from weight loss to obesity and insulin resistance, as excess calorie intake and lipids

Table 3
Characterization of food consumption by children and adolescents with HIV in the included studies.

AUTHOR	TYPE OF FOOD SURVEY	FOOD ANALYSIS METHOD	FOOD CONSUMPTION DETAILS	CARDIOVASCULAR RISK ASSESSMENT METHOD	CARDIOVASCULAR RISK FACTORS (EFFECT MEASURES)
Martín-Cañavate et al.(23)	24h recall FFQ	Principal component analysis. Healthy diet (high factorial load for fruits, vegetables, dairy products, meat and fish), high fat/sugar diet (high factorial load for eggs, meat, oils, fat and miscellaneous), low diversity diet (high factorial load for cereals and legumes)	Daily consumption of cereals and in 86% there was consumption of legumes three or more times a week, 63% for eggs, fish and meat. 84% consumed the food group that includes sweets, soft drinks, sugar, pizza and chocolate milk more than three times a day. 61% consumed fruits, 28% vegetables and 32% dairy products. High consumption of carbonated beverages	NR	NR
Tremeschin et al.(20)	FFQ	Adequacy of intake	Intake of energy and other nutrients within the DRIs	NR	NR
Sharma et al.(8)	24h recall	Adequacy of intake	Total energy exceeded needs. The consumption of carbohydrates, lipids and proteins within the recommendations in the age group of 4 to 18 years. Cholesterol intake below recommendations for females. Inadequate fiber intake. High consumption of sugary drinks	NR	NR
Werner et al.(19)	FFQ	Adequacy of intake	In 53.3% the total energy intake was 120% above the recommendation. Carbohydrates exceeded the recommendations. IPL below the reference between 3 and 8 years of age. Cholesterol consumption above 300mg/day. Low fiber intake in children over 9 years old	NR	NR

Table 3 (continued)

Author	Type of food survey	Food analysis method	Food consumption details	Cardiovascular risk assessment method	Cardiovascular risk factors (effect measures)
Hillesheim et al.(18)	FFQ	Adequacy of intake	Energy intake 50.8% above needs in 89.8% of the sample. Carbohydrates and proteins adequate in 60.5% and 15.2%, respectively. LIP below by 24.3%. Inadequate intake frequency for polyunsaturated fat (100%), cholesterol (57.1%), vitamin A (34.7%), vitamin C (26.5%), calcium (61.2%) and fiber (40. 8%)	NR	NR
Shiau et al.(9)	24h recall FFQ	Adequacy of intake	Energy within the recommendations in 71%, 10.6% exceeded and 18.4% below. HIV-infected individuals had a higher intake of carbohydrates. Lipids and proteins below the reference and higher intake of saturated and trans-fat. Low fiber intake. More than 50% did not meet the micronutrient recommendation. 1/3 exceeded recommendations for sugar intake	NR	NR
Arpadi et al.(22)	24h recall	Adequacy of intake	Energy below recommendations in the stunted group. There was no difference in consumption between groups for carbohydrates, lipids and proteins	Weight, height, fat free mass, viral load, resting energy expenditure and energy intake	Significant inverse relationship between energy intake and fat-free mass: fat-free mass [kg]= 9.74 + 1.85 · age [years] – 1.17 · log viral load [viral replication; copies/dL], R^2= 0.63, SEE= 3.35, P < 0.001)
Papi et al.(11)	24h recall	Adequacy of intake	Inadequate consumption of vegetables/fruits	Peripheral lipodystrophy, centripetal or mixed lipohypertrophy, laboratory abnormalities (total cholesterol, triglycerides, glucose, T CD4 and viral load), height, weight, skinfolds (triceps, subscapular and brachial), waist circumference and dietary assessment	Sugar and fat intake was significantly associated with lipodystrophy syndrome (OR = 3.40, P = < 0.01). Inadequate intake of vegetables and fruits was significantly associated with lipodystrophy syndrome (OR = 3.40, P = 0.02)

Table 3 (continued)

Author	Type of food survey	Food analysis method	Food consumption details	Cardiovascular risk assessment method	Cardiovascular risk factors (effect measures)
Ziegler et al.(12)	24h recall	Adequacy of intake	Adequate intake of carbohydrates and proteins. Lipids exceeded the recommendations in the HIV+ group, Inadequate intake of micronutrients (vitamin A, D, E, K, pathothenic acid, folate, calcium, magnesium and potassium). Sodium above recommendations by 236-247%. Low fiber consumption. Increased consumption of saturated and trans fat. Adequate intake for cholesterol	Anthropometry (weight, height, waist and hip circumference), clinical (antiretroviral therapy and T CD4 cell count), laboratory (HDL and LDL profile, CD4 T count and HIV RNA) and nutritional intake	Mean HDL-c significantly lower (infected= 44.1±15.9 and uninfected= 51.1±13.0, P= 0.001) and triglycerides significantly higher in the HIV-infected group than in the uninfected group (infected= 84.3±53.8 and uninfected=58.5±23.7, P= 0.001). HIV-infected group: significant difference between intake of trans fats and plasma LDL-c (r=0.158 and P= 0.040), fiber intake and plasma triglycerides (r= 0.157 and P=0.041). Negative correlation between fat intake and triglycerides (r= -0.170 and P=0.027)
Padmapriyadarsini et al.(24)	24h recall food Insecurity questionnaire (Household Food Access Insecurity)	Adequacy of intake	Intake of energy and other nutrients within the DRIs	Clinical (total cholesterol, triglycerides, HDL, LDL, glycemia, serum insulin, C-reactive protein, percentage of T CD4 cells and HIV viral load) and anthropometric (height, weight, arm, head, chest and waist circumferences, skinfolds skin areas of the biceps, triceps, subscapular and suprailiac) and nutritional value of the diet	Significant association between macronutrient intake and serum lipid levels in girls >9 years old. Girls with altered serum triglycerides: higher fat intake compared to peers with normal triglyceride levels (34 vs. 24 mg/dL; P= 0.04)
Martins et al.(25)	24h recall	Adequacy of intake	Energy above recommendations by 63.3%. High consumption of foods rich in protein, sugar and sodium. Inadequate intake of micronutrients. Inadequate fiber intake	Anthropometry (weight, height, triceps skinfold and arm circumference), electrical bioimpedance (fat mass and lean body mass, resistance, reactance, phase angle and basal metabolic rate) and food intake	Higher BMI z-score associated with lower fiber intake (rs= -0.482; P= 0.006)

Table 3 (continued)

Author	Type of food survey	Food analysis method	Food consumption details	Cardiovascular risk assessment method	Cardiovascular risk factors (effect measures)
Tanaka et al.(21)	24h recall	Diet Quality Index	Low score for mean Diet Quality Index (51.9). Averages were raised to the following components: total cereals, oils, meats and beans, total vegetables and orange-colored vegetables and legumes and dark green. The highest proportion of the maximum score was found for oils (84.1%), followed by a total of cereals (83.0%) and orange and green vegetables and legumes dark (79.6%). On the other hand, the lowest averages were found in whole grains, sodium, whole fruits and calories from solid fats, alcoholic beverages and sugars added. The components with the highest proportion of minimum score (zero) were sodium (86.4%) and cereals full (72.7%).	Waist circumference and z-score for body mass index. Food consumption	Did not identify a statistically significant association between the mean score of the diet quality index and waist circumference (r= 0.17; P=0.115)

NR: not reported.; OR: odds ratio; P: P value; r: Pearson's correlation coefficient; vs: *versus*; rs: Spearman correlation; F: F test; n^2p: effect of the interaction of periods on the analyzed variables.

Table 4

Assessment of the risk of bias in the included studies.

From the author	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Final score	Risk of bias
Arpadi et al. (22)	1	0	1	0	0	0	NA	NA	1	NA	1	0	NA	1	0.50	Moderate
Tremeschin et al(20)	1	0	1	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate
Sharma et al(8)	1	1	1	0	0	0	0	0	1	1	1	0	NR	1	0.53	Moderate
Werner et al.(19)	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	1	0.70	Low
Hillesheim et al(18)	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	1	0.70	Low
Papi et al.(11)	1	1	ND	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate
Ziegles et al. (12)	1	1	ND	1	0	0	1	0	1	0	1	0	ND	0	0.42	High
Tanaka et al. (21)	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	0	0.60	Moderate
Shiau et al.(9)	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	0	0.60	Moderate
Padmapriyadarsini et al. (24)	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	0	0.60	Moderate
Martín-Cañavate et al(23)	1	1	1	1	0	0	NA	NA	1	NA	1	0	NA	1	0.70	Low
Martins et al.(25)	1	1	ND	1	0	0	NA	NA	1	NA	1	0	NA	0	0.50	Moderate

Questions. Q1. Has the research question or objective in this article been clearly stated?. Q2. Was the study population clearly specified and defined?. Q3. Was the participation rate of eligible persons at least 50%?. Q4. Were all subjects selected or recruited from the same or similar populations (including the same time period)? Were the inclusion and exclusion criteria for being in the study pre-specified and uniformly applied to all participants?. Q5. Was a rationale for sample size, description of power, or variance and effect estimates provided?. Q6. For the analyzes in this article, was the exposure(s) of interest measured before the outcome(s) were measured? Q7. Was the time period long enough to reasonably expect to see an association between exposure and outcome, if any? Q8. For exposures that may vary in amount or level, did the study examine different levels of exposure in relation to the outcome (eg, exposure categories or exposure measured as a continuous variable)?. Q9. Were exposure measures (independent variables) clearly defined, valid, reliable, and consistently implemented across all study participants?. Q10. Has the exposure(s) been assessed more than once over time?. Q11. Were the outcome measures (dependent variables) clearly defined, valid, reliable, and implemented consistently across all study participants?. Q12. Were outcome assessors blinded to participants' exposure status?. Q13. Was the loss to follow-up after baseline 20% or less?. Q14. Were the main potential confounding variables measured and statistically adjusted for their impact on the relationship between exposure(s) and outcome(s)?; ND, cannot determine; NA, not applicable; 0: No; 1: Yes; 0.70: low risk of bias; ≥ 0.50: moderate risk of bias; <0.50 high risk of bias; *to determine the total score, the following equation was considered: (total of positive answers / total of questions considered for that study.

intensify cardiovascular risk factors in this population.

Furthermore, in the study by Arpadi et al.(22), it is possible to identify that children with a diagnosis of HIV and growth deficit had lower energy intake than children living with HIV and without growth deficit when comparing the daily recommendations for their age. Therefore, inadequate energy intake may be linked to the poor development of fat-free mass and growth in children with HIV.

The dietary pattern of children and adolescents with HIV is based on ultra-processed foods. This can be observed in the study in Martín-Cañavate et al. (23) which identified a pattern of diet rich in sweets, soft drinks, sugar, pizza and chocolate in a sample of at least 10% of individuals living with HIV and overweight or obese. Likewise, Shiau et al. (9) indicate an excess of added sugar intake in 1/3 of the sample of children with HIV. The dietary pattern based on ultra-processed foods has systematically increased in recent years. These types of foods are high in energy density, sugar, unhealthy fats, and are lower in fiber, protein, and micronutrients. In addition, this dietary pattern has a positive relationship with overweight and obesity, increased waist circumference, total cholesterol, LDL-c and triglycerides(30).

In the study of Tanaka et al. (21) the components with the lowest averages were whole grains, sodium, whole fruits, total fruits, calories from solid fats, alcoholic beverages, added sugars and saturated fat. Having low fruit intake. Almost a half retrieved studies reported low micronutrient intake in Hilliesheim et al. (18), Martins et al. (25), Shiau et al. (9), Ziegler et al. (12) and Padmapriyadarsini et al. (24) and the a potential problem is the lack of intake of antioxidant power of these nutrients and their importance for an adequate function of the immune system, lower progression of HIV and its mortality rate (15).

The nutritional transition was responsible for the decrease in the intake of fruits and vegetables in the general population, that is, foods rich in fiber (31). Likewise, this dietary pattern has been described among studies in children and adolescents living with HIV (8-12, 18, 19, 23, 25). A fiber-rich diet has an important effect on glucose and lipid metabolism, which is an important target of the management these patients due to HIV and ART adverse effects. Therefore, they reduce intestinal transit and reduce the absorption of glucose, increasing the fecal excretion of bile acids and helping to reduce cholesterol levels (32).

Some studies selected in this review showed alterations in the lipid profile and, less frequently, in the glycemic profile and body fat. According to Werner et al. (19), there

was a prevalence of dyslipidemia in the sample. In Padmapriyadarsini et al.(24) it was also described that ART-naïve children with moderate to severe immunosuppression have a high prevalence of dyslipidemia, low HDL-c, more than 1/3 with high triglycerides and almost 1/4 with insulin resistance. As in Ziegler et al. (12) in the HIV-infected group, with significantly lower mean HDL-c and significantly higher triglycerides. In addition, in this group, there was a positive correlation between trans-fat intake and plasma LDL, as well as fiber and triglyceride intake.

The consumption of soft drinks, snacks, sweets and pizza is an indicator of an unhealthy diet and is related to a low intake of dietary fiber, regardless of the HIV diagnostic condition. These foods are considered ultra-processed, often high in saturated fat and sugar(21). The contribution of saturated fats to cardiovascular risk may be related to their ability to increase, by mechanisms similar to those of trans fats, the plasmatic concentration of cholesterol, LDL-c and their effect in reducing HDL-c(29).

Hypertriglyceridemia was found in at least 36.4% of the sample. Among them, Martins et al.(25) pointed out that the z-score for body mass index was showing overweight in 25% of the sample. There was also a prevalence of lipodystrophy in 32.2% of the patients. Furthermore, 78% of men and more than 95% of women had a waist/hip ratio above the cutoff points. In the article by Papi et al.(11), among children using HAART, 46 of them were classified as having lipodystrophy syndrome, with 22% lipoatrophy and 32% lipohypertrophy.

The scientific literature describes that individuals with overweight and abdominal fat have a higher prevalence of cardiovascular risk factors (hypertension, diabetes and dyslipidemia)(33), factors that can be identified in the aforementioned studies.

In this context, it is worth noting that other factors may be contributing to the increase in cardiovascular risk factors in populations with HIV other than inadequate nutrition, but the chronic activation of the immune system due to the virus infection itself and the adverse effects of the use of ART. Therefore, a risk factor considered multifactorial(33).

We conclude that there is inadequate consumption of energy, fiber and micronutrients; however, the macronutrients, intake meet the recommendations for carbohydrates, proteins and lipids (below the recommendations in the same proportion). In addition, to a dietary pattern of low consumption of fruits and vegetables. Few studies reported associations of food intake with cardiovascular risk factors (triglyceride, HDL-c, LDL-c, total cholesterol and body fat (lipoatrophy and lipohyperatrophy).

There is lack of studies that seek the association between food consumption and cardiovascular risk factors in children and adolescents living with HIV. More research is needed to test the hypothesis if healthy dietary patter of food intake could mitigate cardiovascular risk factors, and finally, support intervention strategies in children and adolescents living with HIV. A limitation of this review was the impossibility of summarizing the effect size measures and the limit of confidence intervals of the results of the included studies.

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Declaration of conflicts of interest

The authors have no conflicts of interest to declare.

Contributors

Participated in the analysis, interpretation and writing of the work: MHTJ. Participated in the collection of information, analysis, interpretation, bibliographic survey and critical review: MSMS. Participated in the conception and development, methodological design, guidance, collection, analysis and interpretation of data, writing and critical review: LRAL and MISA

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3 COLETÂNEA DE ARTIGOS:

2º ARTIGO

JESUS, M. H. T.; ANDRADE; M. I. S.; LIMA, L. R. A. Padrão alimentar preditor e protetor do risco cardiovascular segundo o método dos escores em adolescentes alagoanos que vivem com HIV. Clinical Nutrition (Qualis A1, segundo os critérios do sistema Qualis CAPES/Área de Nutrição).

Predictive and protective dietary pattern of cardiovascular risk according to the scoring method in adolescents living with HIV from Alagoas

Monyque Hellen Teixeira de Jesus[a], Maria Izabel Siqueira de Andrade[b], Luiz Rodrigo Augustemak de Lima[c,d]

[a] Postgraduate Program in Nutrition (PPGNUT), Federal University of Alagoas (UFAL). Maceió, Alagoas, Brazil
[b] Faculty of Nutrition, Federal University of Alagoas (UFAL). Maceió, Alagoas, Brazil
[c] Postgraduate Program in Nutrition, Federal University of Santa Catarina, Health Sciences Center, University Campus, Trindade, Florianopolis, Santa Catarina, Brazil;
[d] Institute of Physical Education and Sport (IEFE), Federal University of Alagoas (UFAL). Maceió, Alagoas, Brazil

Address correspondence to: Luiz Rodrigo Augustemak de Lima. Postgraduate Program in Nutrition, Federal University of Alagoas, Campus A.C. Simões. Maceió-AL, Av. Lourival Melo Mota, S/N, Tabuleiro do Martins, CEP: 57072-970, Brazil. Email: luiz.lima@iefe.ufal.br

S U M M A R Y

Background and objectives: The advent of antiretroviral therapy (ART) has significantly reduced the morbidity and mortality of individuals living with the human immunodeficiency virus (HIV). However, HIV and the adverse side effects of ART, in addition to an unhealthy lifestyle (ie, poor diet) can contribute to the development of cardiovascular and metabolic events that increase the risk of cardiovascular disease. The aim of this study was to evaluate dietary pattern and cardiovascular risk factors in adolescents living with HIV. Methods: Observational cross-sectional study involving 34 adolescents diagnosed with HIV. Food consumption was obtained using the Food Frequency Questionnaire (FFQ) and analyzed according to the scoring method. Cardiovascular risk factors included overweight variables (overweight and obesity), high waist circumference, high systolic and diastolic blood pressure, undesirable results for lipid profile (total cholesterol, triglycerides, high-density lipoprotein and low-density cholesterol) and glycemic (glucose). Results: There was a prevalence of dyslipidemia, with 77.7% of the population having low levels of HDL-c and, in 50.0%, high levels of triglycerides. There was a higher consumption of the protective diet to the detriment of the cardiovascular risk predictor. Despite this, there was a significant association between consumption of a predictive diet and lower systolic blood pressure values (p=0.04). Conclusion: A high consumption of a protective diet was identified to the detriment of the predictor of cardiovascular risk, which may be related to the Brazilian food culture.

Keywords: HIV. Food intake. Nutrients. Cardiovascular diseases. Adolescent.

1. Introduction

Over the last few decades, HIV-infected individuals have had an increase in survival and, as a consequence, a decrease in mortality due to the combined antiretroviral therapy (ART) (1, 2). ART's objective inhibits viral replication to undetectable levels, strengthen immune function and reduce the incidence of opportunistic infections, in addition to slowing down the activation of pro-inflammatory cytokines, reducing the risk of resistance to antiretroviral drugs and providing less toxicity (3-5). Implementation of ART began to ensure the process of full growth and development in children and adolescents living with HIV (4).

On the other hand, ART has adverse effects that, associated with the metabolic alterations of HIV (i.e. chronic immune activation, low-grade chronic inflammation and senescence) culminate in complications that can last for the rest of life (2, 6). Moreover, negative consequences of ART and HIV infection include changes in body fat distribution (lipodystrophy), dyslipidemia and abnormalities in carbohydrate metabolism (3, 6-9). Although the appearance of clinical symptoms of atherosclerosis does not appear in childhood, this atherogenic process starts from the first years of life, which can lead to an increased risk of cardiovascular disease and early atherosclerotic events in adolescents living with HIV (3, 6-9).

Currently, most of adolescents is growing up in an obesogenic and labor saving environment, which results in unhealthy lifestyle habits, such as poor diet and sedentary lifestyle, which lead to weight gain and the emergence of Chronic Noncommunicable Diseases (10) which is in evidence early in the general population (11). Thus, individuals living with HIV on ART which presents the poor dietary are in risk for cardiovascular disease (12).

The inadequacy of diet composition, mainly with a high lipid content and low dietary fiber content, associated with HIV complications and the adverse effects of ART, may be responsible for altering the lipid profile in this population and emphasizing cardiovascular risk factors (13). Data from children and adolescents living with HIV highlight those changes in lifestyle, such as following a healthy diet and practicing physical activity, are crucial to optimizing nutritional status, health and preventing chronic disease complications (14).

The present study aimed to

evaluate the dietary pattern and cardiovascular risk factors in adolescents living with HIV treated at a reference hospital in the state of Alagoas - Brazil.

2. Methods

2.1. Study population and design

This is an observational cross-sectional study. Conducted between March 2022 and January 2023 in adolescents diagnosed with HIV undergoing clinical follow-up at Hospital Escola Dr. Helvio José de Farias Auto – Specialized Assistance Service (HEHA-SAE), located in Maceió, Alagoas - Brazil, being a reference in the care of pediatric patients living with HIV/AIDS in the state.

Approximately 72 adolescents, aged between 10 and 18 years, are undergoing clinical follow-up at HEHA-SAE. Of these, 65 were invited to participate in the study, among them, 25 refused to participate in the research, 40 agreed to participate in the study, with 6 patients excluded (4 without a diagnosis of HIV, 1 with inability to stand and/or move around and 1 pregnant), a total of 34 patients living with HIV were evaluated.

The population was selected, assuming the following inclusion criteria: 1) diagnosis of HIV infection; 2) age 10 to 18 years; 3) clinical follow-up at HEHA-SAE; 4) have clinical and laboratory records. Participants who demonstrated: 1) inability to stand and/or move around were excluded; 2) speech and/or hearing disability; 3) use of enteral and parenteral nutritional therapy.

2.2. Characterization variables

2.2.3. Clinical variables

To characterize the research participants, data were collected on the type and duration of ART, lymphocytes T CD4+ and viral load, with the first four items collected through interviews, using a semi-structured questionnaire developed for the present study and the variables HIV-related data were collected from medical records.

2.2.4. Sociodemographic variables

Data were collected on sex (female or male), age (between 10 and 18 years), date of birth (between 2003 and 2011), skin color (white, brown, black, yellow and indigenous).

Maternal schooling (did not study, incomplete primary education 1st – 1st to 4th grade, elementary education 1st complete – 1st to 4th grade, elementary education 2nd incomplete – 5th to 8th grade, primary education 2nd completed – 5th to 8th grade, incomplete secondary

education – 1st to 3rd year, complete secondary education – 1st to 3rd year, incomplete higher education and completed higher education) in addition to the financial officer's income (up to 2 minimum wages - ≤ R$ 2,078.00, > 2 to 5 minimum wages - > R$ 2,078.00 to R$ 5,195.00, > 5 to 10 minimum wages - > R$ 5,195.00 to R$ 10,390.00, > 10 minimum wages (>R$ 10,390.00 and don't know).

The financial officer's income was classified according to social classes A, B, C, D and E, in which they are considered high, middle, hardworking, poor and low class, respectively. Being described from the number of minimum wages, according to data from the Brazilian Institute of Geography and Statistics.

Class A: above 20 minimum wages, Class B: between 10 and 20 minimum wages, Class C: 4 to 10 minimum wages, Class D: 2 to 4 minimum wages and Class E: up to 2 minimum wages (15).

2.3. Assessment of food intake scores

Food pattern was assessed using a FFQ developed and validated for Brazilian adolescents, with validity to categorize individuals by previous food intake level for most nutrients, except for retinol and iron (16).

The simplified version of the instrument was used, which contains 64 food items, and an adaptation was also made to include typical foods from the Northeast region, such as corn-based foods (couscous), tubers (yam and cassava) and their by-products (tapioca) (17, 18).

The questionnaire is semi-quantitative and has response options in terms of frequency over time (never, less than once a month, once to three times a month, once a week, two to four times a week, once a day and more than once a day). The instrument was applied in the form of an interview following standardized procedures.

The scoring method was used to assess food pattern. For this, consumption frequency was considered a quantitative variable, by converting categories into annual consumption frequency, assigning a weight (S) to each frequency category. It was defined as minimum weight S7=0 and maximum S7=1 for daily consumption and the others were calculated with the equations: $Sn=(1/365) \times (a \times p)$ e $Sn=(1/365) \times ([a \times p) + (b \times p)]/2$, where "a" and "b" are the frequency of food consumption and ''p'' the period. Thus, consumption frequency scores were obtained for two food groups.

In mixed preparations, the

breakdown of nutrients was not carried out, prevailing the basic ingredient of each one of them. For the predictive diet, fried foods, full-fat dairy products (cheese and cream cheese), sausages, vegetable fat (margarine) and ultra-processed foods were considered. And in the protective diet, fruits and natural juices, legumes, vegetables, cereals and derivatives were concentrated. This classification was carried out by researchers graduated in nutrition.

To obtain the frequency score of each group, the sum of the weight of each item was performed (19). Then, the food pattern model was evaluated according to the exploratory variables.

Table 1 describes the nutrients and their respective predominance in foods for the predictive and protective diet for cardiovascular risk.

2.4. Cardiovascular risk variables

2.4.1 Anthropometry and body composition

The anthropometric measurements taken included body mass, height, BMI, waist circumference and skinfolds (subscapular, abdominal, calf and triceps) for the study of body composition (amount and distribution of body fat).

For data collection, the adolescent remained in a bipedal position with relaxed limbs, hanging along the trunk. The place for measuring arm circumference was the midpoint between the distance from the upper part of the acromion and the proximal portion of the radial head (aligned to the lateral aspect), the distance being measured in centimeters (cm) by the anthropometric tape and its distance divided by two (midpoint).

In the same way, the triceps skinfold was performed, but considering the posterior alignment of the arm (fold collected vertically). For the subscapular skinfold, it was considered two cm below the inferior angle of the scapula (laterally and obliquely collected). For the abdominal skinfold, a distance of 5 cm was marked to the right of the umbilicus (from the midpoint of the navel), being measured vertically. For the skinfold of the calf, the point with the greatest volume in the calf and on the inner side of the leg (fold collected vertically) was considered.

For waist circumference, the midpoint between the last rib and the iliac crest was considered. For height, the standing position was considered, with bare feet together and head oriented by the Frankfort plane.

All measurements were performed according to standardized procedures of the *International Society*

for the Advancement of Kinanthropometry (20). The percentage of body fat was calculated by the equation of Lima et al. (21), specific for children and adolescents living with HIV, in which: Percentage of body fat= −10.35622 + (subscapular fold [mm]*0.6324226) + (∑4folds [mm]* 0.2356916) + (abdominal fold [mm]* −0.2812848) + (sex*−1.538853) + (stature[m]*0.0664786), being female= a x e masculine= x.

To calculate the BMI, the weight of each adolescent (in kilograms) divided by their respective height squared was considered. BMI was interpreted using the BMI-for-age index, according to the age and sex of the volunteers and the cutoff points pre-cooked by the WHO curves (22), considering your z-score as accentuated thinness and thinness (< - 2), eutrophy (≥ - 2 e < + 1) and overweight + obesity (≥ + 1) (23).

To calculate the z-score, the AnthroPlus® application was used. For waist circumference, the 90th percentile was considered as the cutoff point in children aged 10 years or older, as established by the criteria of the International Diabetes Federation (IDF) for metabolic syndrome, as well as data from the Third National Health and Nutrition Examination Survey (NHANES III) (24), this same reference was used in the ERICA study of cardiovascular risks in adolescents (25).

The percentage of body fat was evaluated using the cutoff points of Lohman (26), in which it takes into account for males: below ideal < 10%, ideal ≥ 10% ≤ 20% and above ideal > 10%. Whereas in females: suboptimal < 15%, ideal ≥ 15% < 25% and above ideal > 25%.

2.4.2 Blood pressure

The participant previously remained seated for at least five minutes to avoid high values due to inadequate preparation (27). After this, the participant remained seated, with both feet on the ground and with the right arm positioned at the height of the heart.

Systolic and diastolic blood pressure was measured during the I and V of Korotkoff, respectively (27), automatically identified on the device.

For blood pressure, classification was normal when systolic blood pressure and/or diastolic blood pressure < 97th percentile and elevated when ≥ 97th percentile specific for gender and age (28).

In the case of adolescents with values equal to or greater than 120/80 mmHg, high blood pressure was characterized, even if the values were below the 97th percentile (28).

Table 1

Classification of foods in a protective diet and predictor of cardiovascular risk.

DIET	FOODS	PREDOMINANCE OF NUTRIENTS
Predictor	Potato chips or snacks; Margarine; fatty cheeses; Traditional cottage cheese; Mayonnaise; Ramen noodles; Fried pork/beef; Fried chicken/fish; Sausages (ham, mortadella and salami); Fried sausage/sausage; French fries/fried cassava/fried polenta; Pasta ice cream; Fried egg; Ham and cheese lasagna/ravioli/capeleti/ham and cheese cannelloni; Vegetables with mayonnaise; Chicken/Tuna Pate	Saturated fat
	Simple hot dog; Pizza; Biscuit with filling; Cookie without filling; fruit yogurt	Refined CHO and saturated fat
	Fried snacks; Fast food type sandwiches	Refined CHO, saturated and trans fat
	Refrigerator; Sweets (candies, gum, *paçoca*, chocolate, *brigadeiro*, pudding); Sugar; Simple cake/industrialized cake; Corn jelly/glucose/sweets in syrup/homemade sweets/paste or bar sweets; Chocolate powder; baked snacks; Savory pie with filling; Sfiha; Natural refreshments with sugar; Industrialized juices with sugar; Artificial juice with sugar; *Tapioca* stuffed with coconut	Refined CHO
Protector	Baked potato; corn; Cooked squash/raw carrots; Tomato; Lettuce; Beet; Chayote; Broccoli; Litter; mango/papaya; Orange/tangerine; Strawberry/pineapple; Banana; Fruit ice cream; Yam; cassava	CHO complexes and dietary fiber
	Pasta with sugo or garlic and oil; Pasta bolognese/pasta with sauce and chicken; Chicken or fish risotto; Bean	CHO complexes and PTN
	Rice; Breads; corn couscous; Sugar-free natural juices	CHO complexes
	Grilled chicken/fish; Grilled pork/beef; whole milk	PTN
	Olive oil/oil	Monounsaturated and polyunsaturated fats

2.4.3 Laboratory analysis

Based on the data obtained from medical records of routine clinical follow-up of patients living with HIV, the following variables were considered: total cholesterol (reference with fasting < 170 mg/dL, without fasting < 170 mg/dL), triglycerides (reference with fasting < 90 mg /dL, non-fasting < 100 mg/dL), HDL-c (fasting reference > 45 mg/dL, non-fasting > 45 mg/dL), LDL-c (fasting reference <110 mg/dL, non-fasting <110 mg/dL) and glucose (reference with fasting < 100 mg/dL).

The interpretation of metabolic health biomarkers was based on the Brazilian Guideline for Dyslipidemia and Atherosclerosis Prevention(29), Guideline of the Brazilian Society of Diabetes (30) and of National Health and Nutrition Examination Survey (31).

2.5. Statistical analysis

Descriptive statistics were used, using measures of central tendency and dispersion, as well as the use of absolute and relative frequencies. Food pattern scores were analyzed by summing the weights in the weighted average of food scores in each food group.

These were expressed in an ordinal scale presented as simple mean and standard deviation in order to know the food pattern scores of the established food groups, and finally, comparisons between the consumption scores and the variables studied (anthropometry, blood pressure, lipid and glycemic profile, physical activity and sedentary behavior).

Using the median consumption score, differences between food pattern scores and cardiovascular risk factors, such as fractions of serum and glycemic lipids, blood pressure and anthropometry, were tested.

These comparisons were tested using the Mann-Whitney or Kruskal Wallis test, when applicable, since food pattern are variables on an ordinal scale, as discussed in the study by Ferreira et al. (12) and Azevedo et al. (32).

In this case, non-parametric tests are useful. Thus, the two groups of food consumption scores (protective diet and cardiovascular risk predictor diet) and cardiovascular risk factors were compared.

Simple linear regression analyzes were used to determine the association between predictive and protective dietary intake of cardiovascular.

All analyzes were performed using STATA® 13.0 (Stata Corporation®, College Station, TX, USA), a 95% confidence interval was established statistical significance $p \leq 0.05$ was adopted.

2.6. Ethical aspects

This study followed the ethical principles of respect for people's autonomy, indicated by Resolution No. 466, of December 12, 2012, of the National Health Council. All those responsible for the participants signed a term of free and informed consent for the student's participation in the study, as well as the students signed the term of free and informed assent.

This study was approved by the Research Ethics Committee of the Federal University of Alagoas under number CAAE 40332920.0.0000.5013 and opinion number 4.506.466.

3. Results

3.1. Participants baseline characteristics

The study included 34 adolescents diagnosed with HIV from the state of Alagoas, Brazil. Among these participants, 52.9% were female. Mean age was 14.4 ± 2.1 years for both sexes. Most of the volunteers were brown/black (67.6%); at least 91.1% had an income of up to 2 minimum wages and were part of social class E; 61.2% of the mothers had at least ≤ 8 years of education; 70.5% had an undetectable viral load; 54.5% were using ART with protease inhibitors. The average number of T CD4 cells was 882.9 ± 473.7 cells/µl. Table 2 describes information about the socio demographic and clinical characteristics.

3.2. Characterization of cardiovascular risk factors

It was found that 73.5% of the adolescents had a BMI adequate for their age. All individuals had acceptable values for waist circumference. Adolescents had normal levels for glucose, total cholesterol, LDL-c and blood pressure in 73.9%, 80.7%, 79.1% and 90.6%, respectively.

However, the population shown acceptable values of triglycerides (50%) and a large part of the population had HDL-c below the recommended levels (77.7%). Table 3 presents the cardiovascular risk factors. Finally, 76.4% of the individuals had a body fat percentage below the reference values.

3.3. Characterization of food pattern of adolescents living with HIV

It was observed that the sample had a higher median consumption score for protective foods than foods that predict cardiovascular risk. Figure 1 shows the average of food pattern scores between the two diets. Also, a low daily consumption of fruits and vegetables was detected and a higher consumption of rice, beans, bread, corn couscous and olive oil/oil (protectors). As well as high

consumption of added sugar, sweets, fried preparations (chicken, fish, egg, sausage and sausage), soft drinks, biscuits and sausages (predictors). Figure 2 shows the percentage of frequency of consumption of protective foods and predictors of cardiovascular risk.

3.4 Food pattern scores and cardiovascular risk factors

Was not found evidence of significant differences between the consumption of a protective diet between categories of sex, age, BMI, waist circumference, total cholesterol, LDL-c, HDL-c, triglycerides, blood pressure, body fat percentage. Also, no significant differences were found between predictive diet consumption between genders, age, BMI, waist circumference, total cholesterol, LDL-c, HDL-c, triglycerides, blood pressure, body fat percentage, physical activity and behavior sedentary. Table 4 lists the comparison of food pattern scores and cardiovascular risk factors.

3.5 Association between dietary intake and cardiovascular risk factors

It was observed that the the consumption of predictive foods for cardiovascular risk was associated to the lower the systolic blood pressure ($p=0.047$) (Table 5) in single linear regression model.

4. Discussions

The present study identified the prevalence of dyslipidemia in adolescents living with HIV. On the other hand, consumption of cardiovascular risk predictor foods was significantly associated with lower systolic blood pressure values. On the other hand, there was a high consumption of protective foods for cardiovascular risk to the detriment of predictors.

A characteristic of HIV infection is the chronic activation of the immune system, this inflammatory environment in the host, caused by HIV, drives the development of cardiovascular diseases by altering lipid metabolism, being an important context for morbidity and mortality in HIV (33).

The introduction of ART for HIV-infected individuals is of paramount importance, as it has the ability to reduce plasma viremia, increase the number of CD4 T lymphocytes and, as a consequence, reduce events related to acquired immunodeficiency syndrome (AIDS) and related mortality to HIV. Despite the success of this therapy, it also has adverse effects, such as dyslipidemia, insulin resistance, increased intra-abdominal fat, among

others. These alterations increase the risk of developing cardiovascular diseases, mainly linked to the negative consequences of the infection itself (34). This may explain the prevalence of dyslipidemia found in this study.

The etiology of cardiovascular diseases may also be linked to genetic factors, smoking, high blood pressure, hypercholesterolemia, diabetes, obesity and intervention in lifestyle habits, such as poor diet and physical inactivity (33, 35). However, regardless of HIV infection, an unhealthy diet can further increase cardiovascular risk factors (36). The scientific literature reports that the atherosclerotic process begins in childhood and takes years to progress. Therefore, cardiovascular diseases in adults and the elderly have their basis in childhood (35).

Therefore, the altered results for HLD-c and triglycerides in this study become aggravating in this situation. In view of all the above reasons, it is relevant to identify the eating habits of adolescents with HIV, as they are a high-risk public for this condition.

Tremeschin et al. (2011) (37) reported an evolution in the nutritional status of children and adolescents with HIV, evolving from weight loss to obesity and insulin resistance, as excess calorie and lipid intake intensified cardiovascular risk factors in this population.

On the contrary, this research demonstrates results of prevalence of the state of emaciation. This fact can be explained by the clinical variable of the disease, since adolescents with HIV may have lower height and body mass when compared to healthy individuals due to the late onset of puberty correlated with mitochondrial toxicity by HIV and ART, psychosocial factors, deficiency in food intake of nutrients, losses in the secretion of growth hormone, among others (38).

Studies report that the food intake of children and adolescents with HIV is similar to that of healthy individuals (37, 39). Therefore, the result found in these patients, who reveal the consumption of a protective diet, corroborates with the dietary pattern of the Brazilian population, in which it demonstrates a higher frequency of consumption of foods considered healthy, such as rice and beans, in addition to typical foods of the culture northeastern, like corn couscous (40, 41).

In addition, data found in the present study are similar to the results of the National School Health Survey (PeNSE), of 2012 and 2019 (42) in which they demonstrate prevalence in the consumption of sweet and salty sweets and cookies, as well as the low consumption of fruits and vegetables in

healthy Brazilian adolescents, characterized as predictive habits for the development of chronic non-communicable diseases; being an additional risk behavior for this population (42, 43).

The adequate BMI identified in this study is in agreement with the results of the literature, in which it was observed that the therapy improved weight and weight/height in children and adolescents with HIV. However, weight gain was not enough to cause excess weight in most individuals.

Likewise, the presence of dyslipidemia in this public is consistent with findings in the scientific literature, with a possible strong influence of HIV infection and the drugs used. In addition, to becoming a risk factor that precedes changes in body composition (44).

With regard to dyslipidemia, the literature reveals a positive association between the consumption of dietary fibers and serum levels of HDL-c, as well as the consumption of foods rich in total, saturated and trans fat and serum levels of triglycerides in HIV, with intervention being dietetics one of the segments with the greatest magnitude of impact on triglycerides (45).

The high frequency of dyslipidemia in adolescents with HIV in this study shows the importance of multidisciplinary care for these patients and nutritional guidelines (potential modifiable risk factor) to reduce excessive consumption of calories, saturated/trans fats and increased fiber intake (46).

It is important to emphasize that this study found low consumption of some foods rich in dietary fiber, such as vegetables, by adolescents living with HIV. Similar data were also found in Souza et al. (41) in healthy adolescents, making this type of intervention even more relevant.

Tavares(47) found that the consumption of ultra-processed foods among adolescents was associated with components of the metabolic syndrome. This is an important context, since this study identified high consumption of soft drinks and sausages.

The high consumption of refined cereals and trans fatty acids (mostly found in ultra-processed foods), together with the low intake of foods rich in fiber and minerals (fruits and vegetables), indicate eating habits that can contribute to the exacerbation of risk of cardiovascular disease present in the population(36).

All this frequency of food pattern found in this study and in other data from the scientific literature, reveals a concern since it can lead to a greater propensity

Table 2
Characterization of the sample of adolescents from Alagoas living with HIV, Maceió/AL, 2022.

Variables	Both (n=34)	Female (n=18)	Male (n=16)
Age (years), mean (sd)	14,4 (2,1)	14,6 (2,1)	14,2 (2,2)
Skin color, n (%)			
White	7 (20,5)	3 (16,6)	4 (25,0)
Brown/black	23 (67,6)	12 (66,6)	11 (68,7)
Yellow/indigenous	4 (11,7)	3 (16,6)	1 (6,2)
Income (reais), n (%)			
Class E	31 (91,1)	18 (100,0)	13 (81,2)
Class D	2 (5,8)	0 (0,0)	2 (12,5)
Class A, B and C	1 (2,9)	0 (0,0)	1 (6,2)
Mother's education, n (%)[a]			
≤ 8 years	19 (61,2)	10 (62,5)	9 (60,0)
> 8 years	12 (38,7)	6 (37,5)	6 (40,0)
T CD4 (cells/mm3), mean (sd)	882,9 (473,7)	823,0 (400,6)	950,3 (550,0)
Viral load, n (%)			
Undetectable	24 (70,5)	12 (66,6)	12 (75,0)
Detectable	10 (29,4)	6 (33,3)	4 (25,0)
ART, n (%)[b]			
Does not use ART	2 (6,0)	1 (5,5)	1 (6,6)
ART without PI	13 (39,3)	8 (44,4)	5 (33,3)
ART with PI	18 (54,5)	9 (50,0)	9 (60,0)
ART time (years), mean (sd)	8,5 (3,4)	7,6 (3,6)	9,4 (3,0)

Class E (rabble)= up to 2 minimum wages; Class D (poor)= > 2 to ≤ 5 minimum wages; Class A, B and C (high, medium and hardworking, respectively) = > 5 minimum wages; ART= antiretroviral therapy; PI = protease inhibitors; Minimum wage = R$ 1,212.00. mother's education= ≤ 8 years (did not study, incomplete elementary school 1 – 1st to 4th grade, elementary school 1 complete – 1st to 4th grade, elementary school 2nd incomplete – 5th to 8th grade - and elementary school 2 complete – 5th to 8th grade); > 8 years (incomplete secondary education – 1 to 3 years, complete secondary education – 1 to 3 years, incomplete higher education and completed higher education). Undetectable viral load= < 40 copies/mL; Detectable viral load= ≥ 40 copies/ml; [a]N=31; [b]N= 33.

Table 3

Cardiovascular risk factors in adolescents from Alagoas living with HIV, Maceió/AL, 2022.

Variables	Both (n=34)	Female (n=18)	Male(n=16)
BMI (kg/m²), n (%)			
Thinness	4 (11,7)	1 (5,5)	3 (18,7)
Eutrophy	25 (73,5)	16 (88,8)	9 (56,2)
Overweight	5 (14,7)	1 (5,5)	4 (25,0)
Glucose (mg/dL), n (%)[a]			
Acceptable	20 (80,0)	10 (76,9)	10 (83,3)
Undesirable	5 (20,0)	3 (23,0)	2 (16,6)
Total cholesterol (mg/dL), n (%)[b]			
Acceptable	23 (82,1)	12 (80,0)	11 (84,6)
High	5 (17,8)	3 (20,0)	2 (15,3)
LDL-c (mg/dL), n (%)[c]			
Acceptable	21 (77,7)	11 (73,3)	10 (83,3)
High	6 (22,2)	4 (26,6)	2 (16,6)
HDL-c (mg/dL), n (%)[d]			
Desirable	6 (22,2)	4 (26,6)	2 (16,6)
Undesirable	21 (77,7)	11 (73,3)	10 (83,3)
Triglycerides (mg/dL), n (%)[e]			
Acceptable	14 (50,0)	8 (53,3)	6 (46,1)
High	14 (50,0)	7 (46,6)	7 (53,8)
Blood pressure (mmHg), n (%)			
Normal	31 (91,1)	18 (100,0)	13 (81,2)
high	3 (8,8)	0 (0,0)	3 (18,7)
Body fat percentage, n (%)			
Below	26 (76,4)	14 (77,7)	12 (75,0)
Ideal	5 (14,7)	3 (16,6)	2 (12,5)
High	3 (8,8)	1 (5,5)	2 (12,5)
Waist circumference (cm), n (%)			
Desirable	34 (100,0)	18 (100,0)	16 (100,0)
Undesirable	0 (0,0)	0 (0,0)	0 (0,0)

Reference points for BMI= marked thinness and thinness (< -2 SD), normal weight (≥ -2 ≤ +1 SD) and overweight (≥ +1 SD); Glucose= desirable (< 100 mg/dL) and undesirable (≥ 100mg/dL); Total cholesterol= acceptable (< 170 mg/dL) and high (≥ 170 mg/dL); LDL-c= acceptable (< 110 mg/dL) and high (≥ 110 mg/dL); HDL-c= desirable (> 45 mg/dL) and undesirable (≤ 45 mg/dL); Triglycerides= acceptable (< 90 mg/dL) and high (≥ 90 mg/dL); Blood pressure= normal (< 97th percentile) and high (≥ 97th percentile); Body fat percentage below < 10% for males and < 15% for females, ideal ≥ 10% to ≤ 20% for males and ≥ 15% to ≤ 25% for females and high > 20% for males and > 25% for females; Waist circumference= desirable (< 90th percentile) and undesirable (≥ 90th percentile); Physical activity (PAQ-c score)= desirable (≥3) and undesirable (<3); [a]N=25; [b]N=28; [c]N=27; [d]N=27; [e]N=28; [f]N=33.

Table 4
Medians and interquartile intervals of food pattern scores according to cardiovascular risk factors in adolescents from Alagoas living with HIV, Maceió/AL, 2022.

Variables		Cardiovascular risk predictor diet		Cardiovascular risk protective diet
Sex				
Female	0,1437	0,1083-0,1739	0,2191	0,1448-0,2679
Male	0,1417	0,1125-0,2171	0,2038	0,1696-0,2551
p-value[a]	0,581		0,890	
Age (years)				
10-14 years	0,1396	0,1239-0,2250	0,2227	0,1790-0,2731
15-18 years	0,1476	0,1042-0,1891	0,2011	0,1346-0,2453
p-value[a]	0,309		0,285	
BMI (kg/m²)				
Thinness	0,1377	0,1135-0,1714	0,1970	0,1426-0,2023
Eutrophy	0,1437	0,1219-0,2153	0,2339	0,1671-0,2711
Overweight	0,1097	0,0981-0,1729	0,2039	0,1575-0,2666
p-value[b]	0,499		0,471	
Glucose (mg/dL)				
Desirable	0,1476	0,1067-0,1937	0,2011	0,1402-0,2404
Undesirable	0,1726	0,1337-0,2031	0,2461	0,2000-0,2937
p-value[a]	0,435		0,110	
Total cholesterol (mg/dL)				
Acceptable	0,1514	0,1091-0,1929	0,2036	0,1471-0,2646
High	0,1437	0,1140-0,1777	0,2407	0,1582-0,2796
p-value[a]	0,881		0,453	
HDL-c (mg/dL)				
Desirable	0,1337	0,1024-0,1707	0,2236	0,1640-0,2467
Undesirable	0,1437	0,1094-0,2023	0,236	0,1357-0,2618
p-value[a]	0,579		0,705	
LDL-c (mg/dL)				
Acceptable	0,1517	0,1096-0,2023	0,1986	0,1425-0,2711
High	0,1226	0,0898-0,1437	0,2400	0,1722-0,2437
p-value[a]	0,115		0,600	
Triglycerides (mg/dL)				
Acceptable	0,1394	0,1052-0,1888	0,2032	0,1448-0,2483
High	0,1477	0,1099-0,1984	0,2171	0,1547-0,2987
p-value[a]	0,566		0,613	
Blood pressure (mmHg)				
Normal	0,1437	0,1100-0,1940	0,2304	0,1696-0,2646
high	0,1200	0,1097-0,1200	0,1986	0,1646-0,1986
p-value[a]	0,379		0,448	
Body fat (%)				
Below	0,1447	0,1175-0,2135	0,2011	0,1448-0,2679
Ideal	0,1320	0,1040-0,1833	0,2375	0,2082-0,2684
high	0,1097	0,0926-0,1097	0,2039	0,1971-0,2039
p-value[b]	0,433		0,689	

U test of Mann Whitney[a] and Kruskal Wallis[b] in the comparison between protective diet and diet predictor of cardiovascular risk ($p < 0.05$). Reference points for BMI= marked thinness and thinness (< -2 SD), normal weight (≥ -2 ≤ +1 SD) and overweight (≥ +1 SD); Glucose= desirable (< 100 mg/dL) and undesirable (≥ 100mg/dL); Total cholesterol= acceptable (< 170 mg/dL) and high (≥ 170 mg/dL); LDL-c= acceptable (< 110 mg/dL) and high (≥ 110 mg/dL); HDL-c= desirable (> 45 mg/dL) and undesirable (≤ 45 mg/dL); Triglycerides= acceptable (< 90 mg/dL) and high (≥ 90 mg/dL); Blood pressure= normal (< 97th percentile) and high (≥ 97th percentile); Body fat percentage below < 10% for males and < 15% for females, ideal ≥ 10% to ≤ 20% for males and ≥ 15% to ≤ 25% for females and high > 20% for males and > 25% for females; Waist circumference= desirable (< 90th percentile) and undesirable (≥ 90th percentile).

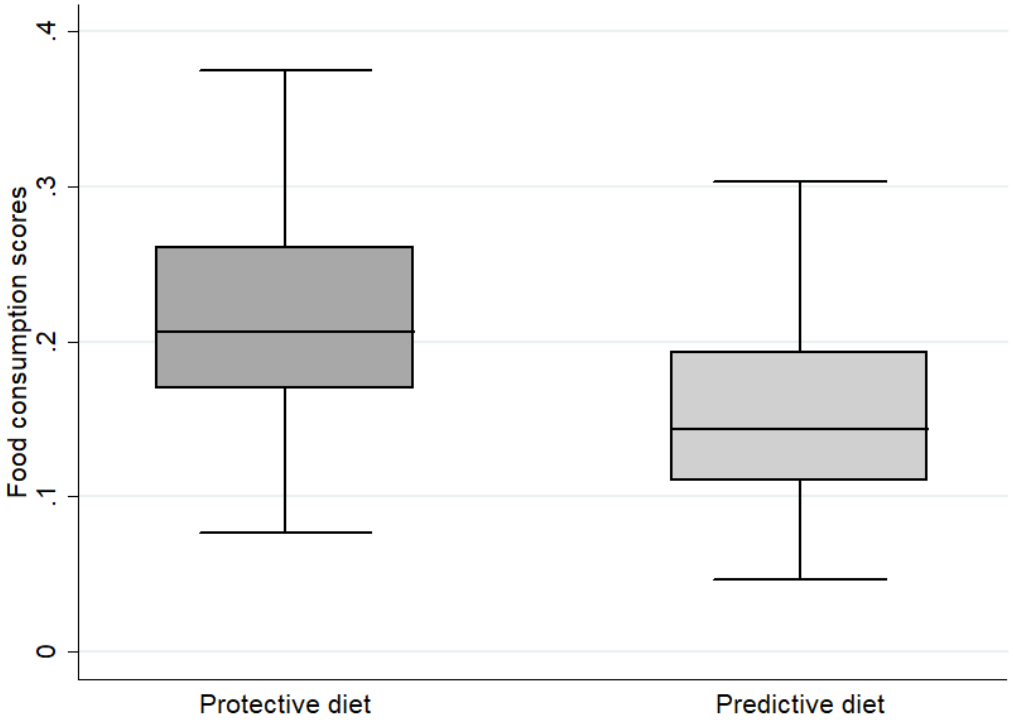

Fig. 1 Consumption scores of the protective diet that predicts cardiovascular risk in adolescents living with HIV, Maceió/AL, 2022.

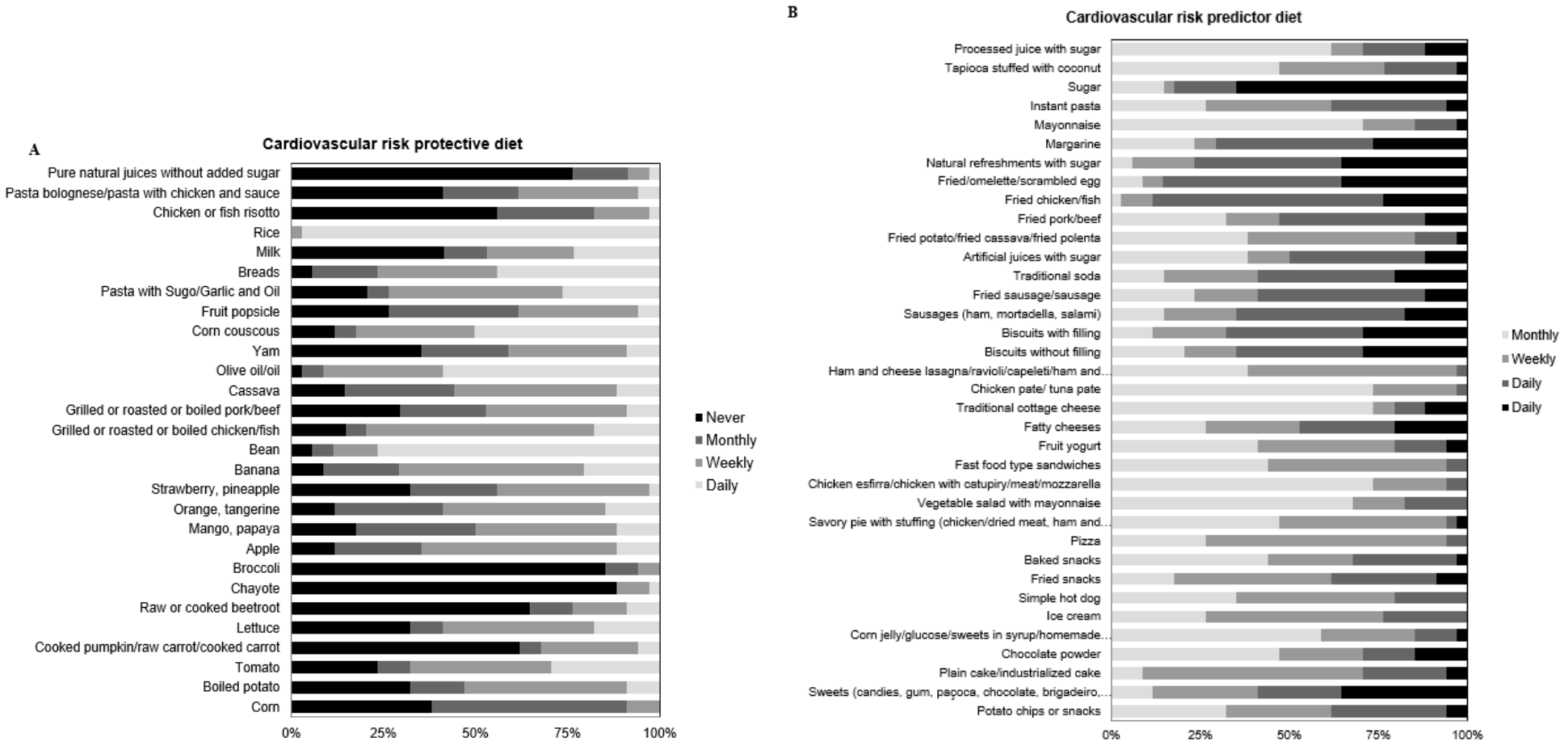

Fig. 2. Percentage of frequency of consumption of protective foods (A) and predictors (B) of cardiovascular risk in adolescents living with HIV, Maceió/AL, 2022. Black color on the cardiovascular risk protective diet chart: a warning sign, as they are cardioprotective foods and ‘‘never’’ consumed. Thus, successively, until those consumed ‘‘daily’’, represented by the lighter color. Black color in the cardiovascular risk predictor foods and are consumed ‘‘daily’’. Thus, successively, until the ‘‘never’’ consumed, represented by the lighter color.

Table 5
Regression coefficients for the associations of protective food consumption and predictive food consumption with cardiovascular risk factors in adolescents living with HIV, Maceió/AL, 2022.

Outcomes	Protective food consumption			Predictive food consumption		
	β	p value	R^2	β	p value	R^2
Sum of skinfolds (mm)	3.651669	0.877	0.0008	-47.93333	0.067	0.1010
Waist circumference (cm)	-3.701214	0.850	0.0011	-37.37492	0.087	0.0888
Glucose (mg/dL)	32.61295	0.102	0.1121	-1.053742	0.964	0.0001
Total cholesterol (mg/dL)	25.73636	0.769	0.0034	-144.4486	0.159	0.0747
HDL-c (mg/dL)	-23.94521	0.392	0.0294	-53.70413	0.094	0.1080
LDL-c (mg/dL)	56.85488	0.403	0.0281	-99.30412	0.208	0.0626
Triglycerides (mg/dL)	138.8287	0.418	0.0254	157.2981	0.442	0.0229
Systolic blood pressure (mmHg)	-12.03299	0.680	0.0054	-64.1478	0.047	0.1173

Note: Statistics are β (standardized value), p value of predictor and adjusted coefficient of determination

for cardiovascular risk factors. Therefore, the WHO recommends that dietary interventions be part of AIDS control and treatment programs, as they improve the effectiveness of ART and reduce the risks of developing metabolic abnormalities, especially in the reduction of dyslipidemias (46, 48).

In conclusion, low consumption of fruits and vegetables (foods considered protective against cardiovascular risk) was found, as well as high consumption of added sugar, sweets, fried preparations, soft drinks and sausages (foods considered predictors of cardiovascular risk) in adolescents from Alagoas living with HIV. In addition to the prevalence of dyslipidemia and the significant association between predictor food consumption and systolic blood pressure.

This research may have suffered limitations due to the reduced sample size. Furthermore, the outcome may have suffered a distortion related to the existing confounding factor between the exposure and the outcome, such as the use of ART and the HIV infection itself. It is noteworthy that the lipid and glycemic profile data were obtained from medical records.

Furthermore, the FFQ has some limitations regarding the loss of details of the quantification of intake (not very accurate), in addition to depending on the memory of the interviewee (49).

Considering the lack of scientific evidence about food pattern and cardiovascular risk in adolescents with HIV, coupled with the scarcity of studies with a direct association between dietary patterns and cardiovascular risk factors in this population, further research is needed in this area. Mainly longitudinal studies, addressing dietary changes arising from changes in behavior or interventions that develop clinically important metabolic alterations in adolescents living with HIV on different ART regimens.

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Conflict of interest

None to disclosure.

Author contributions

Conceptualization: MHTJ; LRAL. Methodology: MHTJ; LRAL; MISA. . All authors contributed to data interpretation; original manuscript draft review and editing. All authors have read and approved the final manuscript.

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4 CONSIDERAÇÕES FINAIS

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A partir das avaliações realizadas do consumo alimentar de adolescentes que vivem com HIV foi identificado um baixo consumo de frutas, legumes e verduras (alimentos considerados protetores do risco cardiovascular). Como também, foi encontrado elevado consumo de açúcar de adição, guloseimas e preparações fritas (alimentos considerados preditores do risco cardiovascular) nestes pacientes. Houve maior consumo de alimentos protetores, rejeitando a hipótese do alto consumo de alimentos preditores do risco cardiovascular, o que pode estar relacionado ao padrão alimentar brasileiro baseado em alimentos considerados saudáveis, como o arroz, feijão, cuscuz de milho, entre outros.

Apesar disso, o baixo consumo de frutas, legumes e verduras, ou seja, alimentos com alto teor de fibras e com potencial antioxidante, pode ser um agravante nessa população, já que esses alimentos auxiliam na diminuição da progressão do HIV e no controle da dislipidemia, este último identificado tanto nesse estudo como em outras pesquisas. Quanto menor era o consumo de alimentos preditores de risco cardiovascular, menor a pressão arterial sistólica, o que também rejeitou a hipótese do estudo.

Não obstante, se torna importante a descrição do padrão alimentar de adolescentes que vivem com HIV, principalmente os alagoanos, que até o momento ainda não tinham esta avaliação, pois isto permite traçar estratégias de saúde pública mais eficazes voltadas para esse público, como a inclusão de orientações nutricionais mais eficientes para o atendimento de adolescentes que vivem com HIV, permitindo melhorar o quadro clínico, laboratorial e de qualidade de vida desses indivíduos.

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5 APÊNDICES

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APÊNDICE A – PROTOCOLO DE REVISÃO SISTEMÁTICA

PROSPERO
International prospective register of systematic reviews

NHS
National Institute for Health Research

UNIVERSITY of York
Centre for Reviews and Dissemination

Systematic review

1. * Review title.

Give the title of the review in English

Food consumption and cardiovascular risk factors of children and adolescents living with HIV

2. Original language title.

For reviews in languages other than English, give the title in the original language. This will be displayed with the English language title.

Consumo alimentar e fatores de risco cardiovasculares em crianças e adolescentes que vivem com HIV

3. * Anticipated or actual start date.

Give the date the systematic review started or is expected to start.

01/07/2021

4. * Anticipated completion date.

Give the date by which the review is expected to be completed.

30/06/2022

5. * Stage of review at time of this submission.

Tick the boxes to show which review tasks have been started and which have been completed. Update this field each time any amendments are made to a published record.

Reviews that have started data extraction (at the time of initial submission) are not eligible for inclusion in PROSPERO. If there is later evidence that incorrect status and/or completion date has been supplied, the published PROSPERO record will be marked as retracted.

This field uses answers to initial screening questions. It cannot be edited until after registration.

The review has not yet started: Yes

Review stage	Started	Completed
Preliminary searches	No	No
Piloting of the study selection process	No	No
Formal screening of search results against eligibility criteria	No	No
Data extraction	No	No
Risk of bias (quality) assessment	No	No
Data analysis	No	No

Provide any other relevant information about the stage of the review here.

6. * Named contact.

The named contact is the guarantor for the accuracy of the information in the register record. This may be any member of the review team.

Luiz Rodrigo Augustemak de Lima

Email salutation (e.g. "Dr Smith" or "Joanne") for correspondence:

Professor Luiz

7. * Named contact email.

Give the electronic email address of the named contact.

luiz.lima@iefe.ufal.br

8. Named contact address

Give the full institutional/organisational postal address for the named contact.

Av. Lourival Melo Mota, S/N. Tabuleiro do Martins

Box Code: 57072-900

Maceió - AL - Brazil

9. Named contact phone number.

Give the telephone number for the named contact, including international dialling code.

+55 82 981816413

10. * Organisational affiliation of the review.

Full title of the organisational affiliations for this review and website address if available. This field may be completed as 'None' if the review is not affiliated to any organisation.

Federal University of Alagoas

Organisation web address:

https://fanut.ufal.br/en/pos-graduacao/master-in-nutrition?set_language=en

11. * Review team members and their organisational affiliations.

Give the personal details and the organisational affiliations of each member of the review team. Affiliation refers to groups or organisations to which review team members belong. **NOTE: email and country now MUST be entered for each person, unless you are amending a published record.**

Professor Luiz Rodrigo Augustemak de Lima. Federal University of Alagoas
Professor Maria Izabel Siqueira de Andrade. Federal University of Alagoas
Monyque Hellen Teixeira de Jesus. Federal University of Alagoas
Maria Sidiane Marques da Silva. Federal University of Alagoas

12. * Funding sources/sponsors.

Details of the individuals, organizations, groups, companies or other legal entities who have funded or sponsored the review.

None.

Grant number(s)

State the funder, grant or award number and the date of award

None.

13. * Conflicts of interest.

List actual or perceived conflicts of interest (financial or academic).

None

14. Collaborators.

Give the name and affiliation of any individuals or organisations who are working on the review but who are not listed as review team members. **NOTE: email and country must be completed for each person, unless you are amending a published record.**

15. * Review question.

State the review question(s) clearly and precisely. It may be appropriate to break very broad questions down into a series of related more specific questions. Questions may be framed or refined using PI(E)COS or similar where relevant.

Is food consumption associated with cardiovascular risk factors in children and adolescents living with HIV?

16. * Searches.

State the sources that will be searched (e.g. Medline). Give the search dates, and any restrictions (e.g. language or publication date). Do NOT enter the full search strategy (it may be provided as a link or attachment below.)

Databases: 1) PubMed/MEDLINE, 2) Web of Science, 3) LILACS, 4) Scopus. Searches will be carried on databases between July 2021 and August 2021. Original articles published in Portuguese, English, and

Spanish will be considered.

17. URL to search strategy.

Upload a file with your search strategy, or an example of a search strategy for a specific database, (including the keywords) in pdf or word format. In doing so you are consenting to the file being made publicly accessible. Or provide a URL or link to the strategy. Do NOT provide links to your search results.

Alternatively, upload your search strategy to CRD in pdf format. Please note that by doing so you are consenting to the file being made publicly accessible.

Do not make this file publicly available until the review is complete

18. * Condition or domain being studied.

Give a short description of the disease, condition or healthcare domain being studied in your systematic review.

The human immunodeficiency virus (HIV) that causes acquired immunodeficiency syndrome disease will be evaluated. HIV infection in the pediatric population mostly occurs through mother-to-child transmission during pregnancy, childbirth, or breastfeeding also called vertical transmission (ALMEIDA, KOCHI, SÁFADI, 2019). HIV infection causes functional dysregulation in the immune system, in addition to increasing oxidative stress (DERESZ et al., 2007). HIV has a high degree of morbidity and mortality and antiretroviral therapy (ART) has shown to be of great importance in increasing the survival and quality of life (CECCATO et al., 2004; [illegible] metabolic effects, such as lipodystrophy, insulin resistance, metabolic syndrome, changes in bone mass, cardiovascular diseases, and increased risk of developing early atherosclerosis (CASTELO FILHO, ABRAD, 2007; GRATÃO; NASCIMENTO; PEREIRA, 2021; LIMA et al., 2018). Literature suggests that nutrition can improve this metabolic profile in adults with HIV, but studies that evaluated food consumption and cardiovascular risk in children and adolescents living with HIV are controversial (SONEGO et al., 2016).

19. * Participants/population.

Specify the participants or populations being studied in the review. The preferred format includes details of both inclusion and exclusion criteria.

Inclusion criteria: Children and adolescents of both sexes, with a diagnosis of HIV infection, from six to [illegible] abnormalities, neurological diseases (i.e. paralysis), individuals who do not eat orally (i.e. enteral and parenteral diet), pregnant adolescents, participants who got the infection for a reason other than transmission vertical (i.e. sexual transmission).

20. * Intervention(s), exposure(s).

Give full and clear descriptions or definitions of the interventions or the exposures to be reviewed. The preferred format includes details of both inclusion and exclusion criteria.

[illegible] food on the prevention and

cause of diseases, for that, we need to measure what the individual eats. The analysis of food consumption is complex. There are a variety of techniques for its measurement, the choice of method meets the research objectives (BOSI et al., 2011; CATTAFESTA, 2017).

The use of qualitative techniques has the objective of observing the eating behavior, not being submitted to a numerical language (BOSI et al., 2011). Thus, the quantitative ones refer to the information collected in the amounts of nutrients and their measurement in average, tertiles, comparison with the nutritional recommendations, among others (CATTAFESTA, 2017).

The assessment of food consumption is important because it has great potential to influence the levels of lipids and other biomarkers that express cardiovascular risk, this is added to the deleterious effects of ART and HIV itself. Therefore, it can be said that there may be a strong correlation between food consumption and cardiovascular risk factors, which may culminate in premature atherosclerosis (FORNÉS et al., 2002; GRATÃO; NASCIMENTO; PEREIRA, 2021; SHIAU et al., 2017).

21. * Comparator(s)/control.

Where relevant, give details of the alternatives against which the intervention/exposure will be compared (e.g. another intervention or a non-exposed control group). The preferred format includes details of both inclusion and exclusion criteria.

Not applicable.

22. * Types of study to be included.

Give details of the study designs (e.g. RCT) that are eligible for inclusion in the review. The preferred format includes both inclusion and exclusion criteria. If there are no restrictions on the types of study, this should be stated.

Observational studies (types: case-control, cross-sectional, and cohorts [both prospective and retrospective]) studies will be included to assess food consumption and cardiovascular risk.

23. Context.

Give summary details of the setting or other relevant characteristics, which help define the inclusion or exclusion criteria.

Research from low- and middle-income to high-income countries will be included.

24. * Main outcome(s).

Give the pre-specified main (most important) outcomes of the review, including details of how the outcome is defined and measured and when these measurement are made, if these are part of the review inclusion criteria.

The expected results are the associations between food consumption of children and adolescents living with

Hy[illegible]ctions, triglycerides);

- dysglycemia (i.e. insulin, HOMA-IR, glucose);

- body fat abnormalities (anthropometric indicators [i.e. BMI/age and waist circumference], body fat percentage and lipodystrophy);

- vascular abnormalities (i.e. systolic and diastolic blood pressure, arterial stiffness, and carotid intima-media thickness).

Measures of effect

Please specify the effect measure(s) for you main outcome(s) e.g. relative risks, odds ratios, risk difference, and/or 'number needed to treat.

Relative risks, odds ratio, prevalence ratio, effect size, correlation, and determination coefficients.

25. * Additional outcome(s).

List the pre-specified additional outcomes of the review, with a similar level of detail to that required for main outcomes. Where there are no additional outcomes please state 'None' or 'Not applicable' as appropriate to the review

None

Measures of effect

Please specify the effect measure(s) for you additional outcome(s) e.g. relative risks, odds ratios, risk difference, and/or 'number needed to treat.

None

26. * Data extraction (selection and coding).

Describe how studies will be selected for inclusion. State what data will be extracted or obtained. State how this will be done and recorded.

The original studies found in the databases will be downloaded and entered into bibliographic management software to exclude duplicate studies. Subsequently, these studies will be checked="checked" value="1" for eligibility criteria (PECOS strategy) by two independent researchers by 1) reading titles and abstracts and 2) reading the full text for inclusion or exclusion in this review. The data extraction process will be performed by the data extracted from the eligible studies will be organized in spreadsheets previously organized according to 1) the characterization of the sample (author, country, year, type of study, age, and proportions), 2) exposures (food consumption expressed in energy and nutrient intake, frequencies, patterns or scores), 3) outcomes (cardiovascular risk factors and the variables that express them), and secondary analyzes of interest in this study. The differences found from the selection and extraction of data will be resolved in a consensus meeting with a final vote for experienced researchers.

27. * Risk of bias (quality) assessment.

State which characteristics of the studies will be assessed and/or any formal risk of bias/quality assessment tools that will be used.

Studies will be analyzed in terms of irks of bias by two independent researchers. The Quality Assessment Tool will be used to assess the quality of observational cohort and cross-sectional studies, available by the National Heart, Lung and Blood Institute (www.nhlbi.nih.gov/health- topics/study-quality-assessment-tools). This assessment tool ranks each study based on fourteen criteria. For each criterion, a score of one will be given if the answer is 'yes', while a score of zero will be given otherwise. A study-specific global score

ranging from zero to fourteen will be calculated by summing the scores on all criteria.

28. * Strategy for data synthesis.

Describe the methods you plan to use to synthesise data. This **must not be generic text** but should be **specific to your review** and describe how the proposed approach will be applied to your data. If meta-analysis is planned, describe the models to be used, methods to explore statistical heterogeneity, and software package to be used.

The information from original studies will be summarized in tables and graphs according to the outcomes of interest to this review, as well as being organized into topics for a better description of the outcomes and possible subgroup analyses.

29. * Analysis of subgroups or subsets.

State any planned investigation of 'subgroups'. Be clear and specific about which type of study or participant will be included in each group or covariate investigated. State the planned analytic approach.

Based on the available data from original studies, we will evaluate subgroups according to age, sex, and clinical variables (i.e. viral load, immunosuppression categories, antiretroviral therapy use).

30. * Type and method of review.

Select the type of review, review method and health area from the lists below.

Type of review

Cost effectiveness
No

Diagnostic
No

Epidemiologic
No

Individual patient data (IPD) meta-analysis
No

Intervention
No

Living systematic review
No

Meta-analysis
No

Methodology
No

Narrative synthesis
No

Network meta-analysis
No

Pre-clinical
No

Prevention

No

Prognostic
No

Prospective meta-analysis (PMA)
No

Review of reviews
No

Service delivery
No

Synthesis of qualitative studies
No

Systematic review
Yes

Other
No

Health area of the review

Alcohol/substance misuse/abuse
No

Blood and immune system
No

Cancer
No

Cardiovascular
Yes

Care of the elderly
No

Child health
Yes

Complementary therapies
No

COVID-19
No

Crime and justice
No

Dental
No

Digestive system
No

Ear, nose and throat
No

Education
No

Endocrine and metabolic disorders
No

Eye disorders
No

General interest
No

Genetics
No

Health inequalities/health equity
No

Infections and infestations
Yes

International development
No

Mental health and behavioural conditions
No

Musculoskeletal
No

Neurological
No

Nursing
No

Obstetrics and gynaecology
No

Oral health
No

Palliative care
No

Perioperative care
No

Physiotherapy
No

Pregnancy and childbirth
No

Public health (including social determinants of health)
No

Rehabilitation
No

Respiratory disorders
No

Service delivery
No

Skin disorders

No

Social care
No

Surgery
No

Tropical Medicine
No

Urological
No

Wounds, injuries and accidents
No

Violence and abuse
No

31. Language.

Select each language individually to add it to the list below, use the bin icon to remove any added in error.
English

There is an English language summary.

32. * Country.

Select the country in which the review is being carried out. For multi-national collaborations select all the countries involved.

Brazil

33. Other registration details.

Name any other organisation where the systematic review title or protocol is registered (e.g. Campbell, or The Joanna Briggs Institute) together with any unique identification number assigned by them. If extracted data will be stored and made available through a repository such as the Systematic Review Data Repository (SRDR), details and a link should be included here. If none, leave blank.

34. Reference and/or URL for published protocol.

If the protocol for this review is published provide details (authors, title and journal details, preferably in Vancouver format)

Add web link to the published protocol.

Or, upload your published protocol here in pdf format. Note that the upload will be publicly accessible.

No I do not make this file publicly available until the review is complete

Please note that the information required in the PROSPERO registration form must be completed in full even if access to a protocol is given.

35. Dissemination plans.

Do you intend to publish the review on completion?

No

Give brief details of plans for communicating review findings.?

The systematic review will be published in high-impact nutrition or medical journals to guarantee visibility and comprehensiveness in scientific communication.

36. Keywords.

Give words or phrases that best describe the review. Separate keywords with a semicolon or new line. Keywords help PROSPERO users find your review (keywords do not appear in the public record but are included in searches). Be as specific and precise as possible. Avoid acronyms and abbreviations unless these are in wide use.

Food Consumption; Human Immunodeficiency Virus

Nutrients

Dietary Pattern

Cardiovascular diseases

Atherosclerosis

Metabolic Diseases

Child

Adolescent

37. Details of any existing review of the same topic by the same authors.

If you are registering an update of an existing review give details of the earlier versions and include a full bibliographic reference, if available.

38. * Current review status.

Update review status when the review is completed and when it is published.New registrations must be ongoing so this field is not editable for initial submission.
Please provide anticipated publication date

Review_Ongoing

39. Any additional information.

Provide any other information relevant to the registration of this review.

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NATIONAL HEART, LUNG AND BLOOD INSTITUTE – NIH. Study quality assessment tools, United States. Disponível em: https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools.

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SONEGO, M. et al. Dyslipidemia, Diet and Physical Exercise in Children on Treatment With Antiretroviral Medication in El Salvador: A Cross-sectional Study. The Pediatric Infectious Disease Journal, v. 35, n. 10, 2016.

LIMA, L. R.; PETROSKI, E. L.; MORENO, Y. M. F.; SILVA, D. A. S. et al. Dyslipidemia, chronic inflammation, and subclinical atherosclerosis in children and adolescents infected with HIV: The PosiHIVe Health Study. PLoS One, 13, n. 1, p. e0190785, 2018.

40. Details of final report/publication(s) or preprints if available.

Leave empty until publication details are available OR you have a link to a preprint (NOTE: this field is not editable for initial submission). List authors, title and journal details preferably in Vancouver format.

Give the link to the published review or preprint.

APÊNDICE B – QUESTIONÁRIO DE FREQUÊNCIA ALIMENTAR

QUESTIONÁRIO DE FREQUÊNCIA ALIMENTAR

Alimento	Quantidade	FREQUÊNCIA DE CONSUMO						
		Nunca	- 1 X Mês	1 a 3 X Mês	1 X Sem	2 a 4 XSem	1 X Dia	2 ou + X Dia
39. Batatinha tipo chips ou salgadinho	1 ½ pacote médio chips/ 1¼ pacote							
40. Guloseimas (balas, chicletes, paçoca, chocolate, brigadeiro, pudim...)	9 balas/ 1½ tablete pequeno/ 3 brigadeiros/ ½ fatia pequena							
41. Sorvete de frutas	1½ picolé							
42. Açúcar	2 colheres de sopa rasas							
43. Bolo simples/ bolo industrializado	2 fatias médias							
44. Achocolatado em Pó	2 a 3 colheres de sopa rasas							
45. Geleia/ glucose de milho/ doces em calda / doces caseiros/ doces em pasta ou em barra	2 colheres de sobremesa cheias/ 1 fatia média							
46. Sorvete de massa	3 bolas média							
47. Hot dog simples - pão, salsicha, molho de tomate e batata palha (ou vinagrete e ketchup ou mostarda ou maionese em substituição a 10g de batata palha)	1 unidade							
48. Salgados	1 pastel/ 2							

fritos (incluindo massa de pastel e torta de maçã frita)	coxinhas/ 2 quibes/ 4 bolinhas de queijo/ 1½ unidade de torta de maçã							
49. Salgados assados (enrolado de presunto e queijo, pão de queijo, pão de batata)	1 unidade grande/ 2 pães de queijo médios							
50. Pizza	2 fatias médias							
51. Tortas salgadas com recheio (frango/ carne seca, presunto e queijo)	2½ pedaços							
52. Salada de legumes com maionese	2 colheres de sopa cheias							
53. Esfirra de frango / frango com catupiry/ carne/ mussarela	1 unidade							
54. Sanduíches tipo fast food (Cheeseburguer salad bacon/ X - Salada/ Cheeseburguer/ cheesefrango/ X-Egg)	1 unidade							
55. Iogurte de frutas	1½ pote							
56. Queijos gordurosos	2 fatias							
57. Leite Integral	1½ copo de requeijão/ 1½ caneca/ 2 xícaras de chá							
58. Requeijão tradicional	1 colher de sopa cheia							
59. Margarina	4 pontas de faca/ 1 colher de sopa rasa							

60. Maionese	1 colher de sobremesa cheia							
60.1 Patê de frango/ patê de atum	1 colher de sobremesa cheia							
61. Azeite/ óleo	1 colher de sobremesa							
62. Arroz	1 prato fundo cheio/ 4 a 5 colheres de servir cheias							
63. Macarrão ao sugo/ alho e óleo	1 prato fundo raso/ 2½ pegadores/ 1 unidade							
63.1 Miojo	1 prato fundo raso/ 2½ pegadores/ 1 unidade							
64. Batata cozida	1 unidade pequena/ 2 a 3 colheres de sopa cheia							
65. Milho	3 colheres de sopa cheias							
66. Batata frita/ macaxeira frita/ polenta frita	5 colheres de sopa cheias/ 2 escumadeiras médias cheias							
67. Lasanha de presunto e queijo/ ravióli/ capeleti/ canelone de presunto de queijo)	2 escumadeiras médias cheias/ 4 escumadeiras médias cheias de ravióli/ 1 prato raso de capeleti/ 5 unidades de canelone							
68. Risoto de frango (arroz, frango, molho de tomate e ervilha) ou peixe	2½ escumadeiras médias cheias							
69. Macarrão à	1 prato fundo/							

bolonhesa/ macarrão com frango e molho	2½ pegadores							
70. Biscoitos sem recheio	9 unidades							
71. Pães	1½ unidade/ 3 fatias							
72. Biscoitos com recheio	8 unidades/ 16 tipo wafer							
73. Tomate	4 a 5 fatias médias							
74. Abóbora cozida/ Cenoura crua/ Cenoura cozida	3 colheres de sopa rasas/ 4 colheres de sopa cheias (crua)							
75. Alface	3 folhas grandes							
76. Beterraba crua e cozida	2 colheres de sopa cheias/ 3 colheres de sopa (crua)							
77. Chuchu	4 colheres de sopa cheias							
78. Brócolis	1 prato de sobremesa cheio/ 4 ramos grandes							
79. Maçã	1 unidade média							
80. Manga, mamão	2 unidades pequenas/ 1 fatia pequena							
81. Laranja, tangerina	1 unidade grande							
82. Morango, abacaxi	10 unidades médias/ 1 fatia grande							
83. Banana	2 unidades médias							
84. Feijão	3 conchas médias rasas							
85. Carne de porco/ bovina frita	1 bife pequeno/ 2 fatias (assado)							
86. Embutidos (presunto, mortadela,	3 fatias/ 8 fatias salame							

salame)								
87. Frango/ peixe frito	1 filé médio							
88. Frango/ peixe grelhado ou assado ou cozido	1 filé pequeno/ 2 pedaços médios/ 2 coxas/ 1 sobrecoxa grande							
89. Carne de porco/ bovina grelhada ou assada ou cozida	1½ bife pequeno/ 5 colheres de sopa/ 4 cubos/ 1 fatia grande							
90. Ovo frito/ omelete/ mexido	1½ unidade/ 1 omelete pequeno/ 5 colheres de sopa rasas							
91. Linguiça frita/ salsicha	2 unidades							
92. Refrigerante tradicional	2 copos de requeijão							
93. Refrescos naturais com açúcar (limonada, laranjada, suco de maracujá)	½ copo de requeijão							
94. Sucos artificiais com açúcar (pré-adoçado)	2 copos de requeijão							
95. Suco industrializado com açúcar (caixinha)	1 copo americano							
96. Sucos naturais puros sem adição açúcar (incluindo com adoçante)	2 copos de requeijão							
97. Inhame	1 pedaço pequeno							
98. Macaxeira	1 pedaço pequeno							
99. Cuscuz de milho	1 fatia pequena							

100. Tapioca recheada com coco	1 unidade média							

APÊNDICE C – QUESTIONÁRIO SOCIODEMOGRÁFICO

QUESTIONÁRIO DE PESQUISA

Orientações gerais ao <u>pesquisador e ao participante</u>:

- ✓ Este questionário será aplicado na forma de entrevista, as questões são sobre o que o participante faz, conhece ou sente.
- ✓ Ninguém irá saber o que o participante respondeu, por isso, **busque a sinceridade** nas respostas.
- ✓ Não deixe questões em branco (sem resposta).

IDENTIFICAÇÃO

Nº de identificação:_____ Ano escolar:_____

Turno:_____ Data da avaliação: ____/_____/_____

Sexo:◯ Masculino◯ Feminino Idade: _____

Data de nascimento: ____/_____/_____

Responsável: _____ Telefone (1): _____ Telefone (2): _____

Cor da pele:◯ Branca ◯ Parda ◯ Preta ◯ Amarela ◯ Indígena

INFORMAÇÕES DA GESTAÇÃO E AMAMENTAÇÃO (PAIS OU RESPONSÁVEIS)

1. Duração da amamentação:◯< 1 mês ◯1 a 2,9 meses ◯ 3 a 5,9 meses ◯ 6 a 8,9 meses◯ 9 a 12 meses

2. Idade gestacional (semanas):◯< 37 semanas ◯ ≥ 37 semanas

3. Peso de nascimento (g): ◯< 2.500 ◯ ≥ 2.500

4.1. Amamentação exclusiva? ◯ Sim ◯ Não 4.2. Idade de desmame: _____

5.1 Tabagismo na gestação◯ Sim ◯ Não 5.2 Consumo de álcool na gestação ◯ Sim ◯ Não

INFORMAÇÕES SOCIODEMOGRÁFICAS

7. Quem é o responsável financeiro da sua família? _____

8. Qual a renda mensal da sua família (o valor atual do salário mínimo é R$ 1.039,00)?

Nº de pessoas na casa_____

◯ Até 2 salários mínimos (≤ R$ 2.078,00)

◯> 2 a 5 salários mínimos (> R$ 2.078,00 a R$ 5.195,00)

◯> 5 a 10 salários mínimos (> R$ 5.159,00 a R$ 10.390,00)

◯> 10 salários mínimos (> R$ 10.390,00)

◯ Não sei_____

9. Marque com um “X” a alternativa que corresponde ao grau de escolaridade da sua mãe:

◯ Não estudou

◯Ensino fundamental 1 incompleto (1 a 4 série)

◯Ensino fundamental 1 completo (1 a 4 série)

◯ Ensino fundamental 2 incompleto (5 a 8 série)

◯ Ensino fundamental 2 completo (5 a 8 série)

◯ Ensino médio incompleto (1 ao 3 ano)

◯ Ensino médio completo (1 ao 3 ano)

◯ Ensino superior incompleto

◯ Ensino superior completo.

APÊNDICE D – FICHA DE AVALIAÇÃO

Avaliador:	**Data da Avaliação:**		
Identificação:	**Ano escolar:**	**Sexo:**	**Data de Nascimento:**
Estágio Pubertal:	**TARV:**	**CD4+:**	**Carga Viral:**

ESTADO NUTRICIONAL E COMPOSIÇÃO CORPORAL (BIOIMPEDÂNCIA)				
	1° Medida	**2° Medida**	**3° Medida**	**OBS:**
Massa corporal (kg)				
Estatura (cm)				
Perímetro da cintura (cm)				
Circunferência do braço (cm)				
Dobra cutânea tricipital (mm)				
Dobra cutânea subescapular (mm)				
Dobra cutânea abdominal (mm)				
Dobra cutânea da panturrilha (mm)				
Altura do tronco (cm)				
SAÚDE CARDIOVASCULAR				
	1° Medida	**2° Medida**	**3° Medida**	**OBS:**
Pressão arterial sistólica (mmHg)				
Pressão arterial diastólica (mmHg)				

EXAMES LABORATORIAIS		
Colesterol total (mg/dl):	Insulina(µIU/ml):	TNF-α (pg/ml)
Triglicerídeos (mg/dl):	Proteína C-reativa (mg/l):	Adiponectina (µg/ml):
HDL-c (mg/dl):	Interleucina-6	VCAM-1(ng/ml)

	(pg/ml):	
LDL-c (mg/dl):	Interleucina-1Ra (pg/ml):	ICAM-1(ng/ml)
Glicose (mg/dl):	Interleucina-1B (pg/ml):	

APÊNDICE E – TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

UNIVERSIDADE FEDERAL DE ALAGOAS
INSTITUTO DE EDUCAÇÃO FÍSICA E ESPORTE

Você, pai/responsável pelo menor está sendo convidado (a) a participar da pesquisa “SAÚDE POSITHIVA DO ADOLESCENTE ALAGOANO:MONITORAMENTO DO ESTILO DE VIDA, APTIDÃO FÍSICA, COGNIÇÃO E RISCO CARDIOMETABÓLICO”, coordenado pelo Prof. Dr. Luiz Rodrigo Augustemak de Lima, professor do Instituto de Educação Física e Esporte (IEFE) da Universidade Federal de Alagoas (UFAL). A participação na pesquisa é de livre vontade e antes de assinar este termo, é importante que você entenda as informações presentes neste documento. A seguir, as informações do projeto de pesquisa com relação a sua participação neste projeto:

1. OBJETIVO DO ESTUDO: Monitorar prospectivamente o estilo de vida, aptidão física, cognição e risco cardiometabólico de adolescentes que vivem com HIV e seus pares expostos não infectados pelo HIV, testando as associações entre diferentes exposições e desfechos.

2. IMPORTÂNCIA DO ESTUDO: A avaliação de vários indicadores de saúde, como a capacidade de realizar esforços, de aprendizado e memória, hábitos saudáveis comoa atividade física e alimentação, análises mais avançadas que podem indicar a presença ou risco futuro de doenças crônicas como colesterol elevado, diabetes e hipertensão. Portanto, o valor na participação está no monitoramento da saúde, de forma ampliada e aprofundada, do seu filho.

3. RESULTADOS ESPERADOS: Espera-se encontrar alterações físicas e laboratoriais decorrentes do HIV e como efeito colateral da TARV que permitem dar mais atenção sobre a saúde. É possível que encontremos algum sinal de prejuízo e ou complicação significativa em termos de saúde física, cognitiva ou mesmo de comportamentos (tabagismo e álcool) inadequados à saúde. Imediatamente após a última etapa, iremos analisar os resultados com vocês e será oferecida uma

orientação nutricional e de prática de atividade física de forma a ser inserida no próprio ambulatório do Hospital.

4. A COLETA DE DADOS: Serão três momentos, em julho de 2021, em janeiro de 2022 e julho de 2022.

5. ETAPAS DO ESTUDO: O estudo terá três etapas: 1) você e seu(ua) filho(a) responderão um questionário para conhecer um pouco mais sobre características e comportamentos, numa entrevista com pesquisador da equipe; 2) o seu filho realizará a avaliação da composição corporal (gordura corporal e muscular), avaliação da pressão arterial e da capacidade de memória, atenção na resolução de problemas, assim como os testes motores de aptidão física (de corrida e força); 3) o seu(ua) filho(a) realizará a coleta de amostras sangue, por uma enfermeira, que ocorrerá no mesmo momento das coletas de rotina, para analisarmos o risco de doenças cardiovasculares. A não participação do(a) seu(ua) filho(a) em alguma etapa não o excluirá das demais avaliações ou prejudicará de qualquer forma o atendimento que ele recebe no hospital. Todas as avaliações ocorrerão em espaço reservado no Hospital Escola Hélvio Auto, após a consulta de rotina que o seu filho (a) já realizou.

6. A SUA PARTICIPAÇÃO: Será na autorização da participação do menor sob sua responsabilidade na pesquisa e ao auxiliar responder as informações na entrevista realizada na primeira etapa de pesquisa.

7. POSSÍVEIS RISCOS E DESCONFORTOS: O(a) seu(ua) filho(a) poderá se sentir constrangido ao responder à entrevista sobre atividade física, alimentação, tabagismos e uso de álcool. Poderá sentir desconforto na avaliação das medidas corporais. Poderá sentir dor e sofrer hematoma na coleta de sangue. Poderá ter dano físico, musculoesquelético e cardiovascular pela realização dos testes de aptidão muscular e aeróbia. Porém, para todos os possíveis danos e desconfortos citados serão tomadas as seguintes medidas preventivas: profissionais treinados irão realizar as medidas corporais; será garantido o anonimato e sigilo das informações obtidas; uma enfermeira treinada irá coletar o sangue; todas as condições que contraindiquem o teste de esforço serão consideradas e obtidas na entrevista. Mesmo assim, em caso de mal-estar ou qualquer problema por causa da participação no estudo, a equipe de

pesquisadores irá dar assistência integral.

8. BENEFÍCIOS ESPERADOS: A participação do(a) seu(ua) filho(a) sob sua responsabilidade no estudo se beneficiará diretamente no acesso a uma avaliação complementar e aprofundada da saúde, num relatório individual. De forma indireta, irá contribuir com importantes informações para compreender melhor o processo de saúde-doença na infância e adolescência com essa condição clínica, que poderá ser aplicada em estratégias de educação e intervenção que ocorrem no Hospital e em todo o SUS.

9. ASSISTÊNCIA: Seu(ua) filho(a) e você têm o direito à assistência integral e gratuita, devido a danos diretos/indiretos e imediatos/tardios, pelo tempo que for necessário ao participante da pesquisa, sendo o responsável o Prof. Dr. Luiz Rodrigo Augustemak de Lima, que suspenderá a entrevista/avaliação/exame e remarcará outra data, se assim o participante e responsável concordarem.

10. VOCÊ SERÁ INFORMADO(A): Do resultado final do projeto e, sempre que desejar, serão fornecidos esclarecimentos sobre cada uma das etapas do estudo.

11. A qualquer momento você poderá recusar a continuar participando do estudo e, também, poderá retirar seu consentimento sem que isso lhe traga qualquer penalidade ou prejuízo.

12. As informações conseguidas através da participação do menor sob sua responsabilidade na pesquisa não permitirão a identificação da sua pessoa, exceto para a equipe de pesquisa, e a divulgação das mencionadas informações será feita apenas entre os profissionais estudiosos do assunto após a sua autorização.

13. O ESTUDO NÃO ACARRETARÁ NENHUMA DESPESA PARA VOCÊ.

14. Você será indenizado(a) por qualquer dano que o menor sob sua responsabilidade venha a sofrer com a sua participação na pesquisa (nexo causal).

15. Você receberá uma via do Termo de Consentimento Livre e Esclarecido assinado

por todos.

16. O estudo poderá ser interrompido caso os pesquisadores percebam algum risco ou dano à saúde do(s) participante(s) da pesquisa ou será suspenso caso seja solicitado pelo Comitê de Ética em Pesquisa com Seres Humanos.

Eu_____, responsável pelo menor _____ que foi convidado a participar da pesquisa, tendo compreendido perfeitamente tudo o que me foi informado sobre a participação no mencionado estudo e estando consciente dos direitos, das responsabilidades, dos riscos e dos benefícios que a participação implica, concordo em autorizar a participação do menor e para isso eu DOU O MEU CONSENTIMENTO SEM QUE PARA ISSO EU TENHA SIDO FORÇADO OU OBRIGADO.

ENDEREÇO DA EQUIPE DE PESQUISA: **Instituição:** Universidade Federal de Alagoas (UFAL), Instituto de Educação Física e Esporte (IEFE). **Endereço:** Campus A.C. Simões Av. Lourival de Melo Mota, S/N. Tabuleiro do Martins - Maceió-AL; CEP: 57072-970. **Telefone:** 3214-1873 **Complemento:** Sala 2 no Complexo Aquático do IEFE	**Contato de urgência**: Prof. Luiz Rodrigo A Lima **Endereço:** Rua Olindina Campos Teixeira, 172, apartamento 201. Edifício Goití. **Cidade/CEP:** 57036-690 **Telefone:** 48 99673 4467 **E-mail:**luiz.lima@iefe.ufal.br

ATENÇÃO: *Se você tiver dúvidas sobre seus direitos como participante de pesquisa, você pode contatar o Comitê de Ética em Pesquisa em Seres Humanos (CEP) da UFAL, pelo telefone: (82) 3214-1041. O CEP trata-se de um grupo de indivíduos com conhecimento científico que realizam a revisão ética inicial e continuada do estudo de pesquisa para mantê-lo seguro e proteger seus direitos. O CEP é responsável pela*

avaliação e acompanhamento dos aspectos éticos de todas as pesquisas envolvendo seres humanos. Este papel está baseado nas diretrizes éticas brasileiras (Res. CNS 466/12 e complementares).

O Comitê de Ética da UFAL analisou e aprovou este projeto de pesquisa. Para obter mais informações a respeito deste projeto de pesquisa, informar ocorrências irregulares ou danosas durante a sua participação no estudo, dirija-se ao:

Comitê de Ética em Pesquisa da Universidade Federal de Alagoas - Prédio do Centro de Interesse Comunitário (CIC), Térreo, Campus A. C. Simões,Cidade Universitária.

Telefone: 3214-1041 – Horário de Atendimento: das 8:00hs às 12:00hs. E-mail: comitedeeticaufal@gmail.com

Maceió, de de .

_____ Assinatura ou impressão datiloscópica do responsável legal e rubricar as demais folhas	Prof. Dr. Luiz Rodrigo Augustemak de Lima (Coordenador da Pesquisa)

APÊNDICE F – TERMO DE ASSENTIMENTO LIVRE E ESCLARECIDO

TERMO DE ASSENTIMENTO LIVRE E ESCLARECIDO

UNIVERSIDADE FEDERAL DE ALAGOAS
INSTITUTO DE EDUCAÇÃO FÍSICA E ESPORTE

Você está sendo convidado(a) a participar da pesquisa “SAÚDE POSITHIVA DO ADOLESCENTE ALAGOANO: MONITORAMENTO DO ESTILO DE VIDA, APTIDÃO FÍSICA, COGNIÇÃO E RISCO CARDIOMETABÓLICO”, coordenada pelo Prof. Luiz Rodrigo Augustemak de Lima, professor do Instituto de Educação Física e Esporte (IEFE) da Universidade Federal de Alagoas (UFAL).

Você é livre para decidir se quer participar. Antes de decidir é importante que você entenda tudo sobre o que será feito:

1. QUEREMOS SABER como está a sua saúde (atividade física, alimentação, sono, capacidade de correr, fazer abdominais, atenção, memória, além de fazer exames mais aprofundados sobre o risco de doenças cardiovasculares no futuro realizadas em amostras de sangue), para compreender como comportamentos e aspectos físicos impactam na saúde.

2. ESSE ESTUDO É IMPORTANTE porque nele serão feitas avaliações de saúde sobre como está a sua capacidade de correr, de força e da memória, assim como queremos saber o quanto faz de atividade física e do que você costuma se alimentar. Ainda terão avaliações importantes para conhecer a saúde do seu coração e pulmão.

3. ESPERAMOS ENCONTRAR RESULTADOS que podem estar alterados, como você se sentir mais cansados nos testes físicos ou mostrar alterações laboratoriais decorrentes da condição clínica ou dos medicamentos que usa, o que permitirá dar mais atenção sobre à sua saúde, mas caso encontremos algum problema vamos tentar ajudar a solucioná-lo. De qualquer forma, vamos conversar com você e seus pais sobre os resultados encontrados e dizer como se alimentar melhor, fazer mais atividade física e ter uma vida mais saudável.

4. A PESQUISA SERÁ FEITA em três momentos, em julho de 2021, em janeiro de 2022 e julho de 2022.

5. A PESQUISA TERÁ TRÊS ETAPAS: 1) responder perguntas sobre suas características e comportamentos; 2) fazer avaliação do tamanho do corpo, como a altura e espessura de “gordurinhas” embaixo da pele, avaliação da pressão do coração e da capacidade de memória, além de testes de corrida e força dos músculos; 3) a coleta de sangue será realizada por uma enfermeira que tem experiência, que ocorrerá no mesmo momento das coletas de rotina, para analisarmos o risco de doenças cardiovasculares. Você não é obrigado a participar de nenhuma etapa, muito menos da coleta de sangue, isto também não irá prejudicar de qualquer forma o atendimento que você recebe no hospital. Todas as avaliações irão acontecer no Hospital Escola Hélvio Auto após a sua consulta de rotina.

6. VOCÊ PODE SENTIR DESCONFORTOS OU RISCOS: Ao responder as perguntas dos questionários sobre atividade física, alimentação, uso de álcool e cigarros. Poderá sentir cócegas ou leves “beliscões” na avaliação das medidas corporais. Poderá sentir dor e sofrer hematoma na coleta de sangue. Poderá se machucar ou cair nos testes de força e corrida. Mas vamos tentar prevenir tudo isso treinando os nossos pesquisadores e seguindo as regras para fazer os testes, vamos garantir também que apenas os pesquisadores tenham acesso ao questionário, mais ninguém! Mesmo assim, em caso de você se sentir mal ou qualquer problema por causa da participação no estudo, estaremos prontos para atender você.

7. OS BENEFÍCIOS DE PARTICIPAR incluem a avaliação da saúde, num relatório que vamos explicar a você e seu pai/mãe ou responsável. De forma indireta, a sua participação pode melhorar o nosso entendimento sobre a saúde e a doença em adolescentes como você. Além disso, vai gerar formas de educar pessoas para a saúde e criar programas de intervenção em saúde.

8. ASSISTÊNCIA: Você tem o direito à assistência integral e gratuita, devido a danos diretos/indiretos e imediatos/tardios, pelo tempo que for necessário ao participante da pesquisa, sendo o responsável o Prof. Dr. Luiz Rodrigo Augustemak de Lima, que

suspenderá a entrevista/avaliação/exame e remarcará outra data, se assim você concordar.

9. VOCÊ SERÁ INFORMADO(A): Do resultado final do projeto e sempre que tiver dúvida poderá nos perguntar.

10. EM QUALQUER MOMENTO, VOCÊ PODERÁ SE RECUSAR a continuar participando do estudo, sem problemas.

11. TODAS AS INFORMAÇÕES DA PESQUISA serão bem guardadas e não permitirão saber quem é você, pois vamos usar números em vez de nomes, apenas entre os pesquisadores saberão “quem é quem”, claro, após a sua autorização.

12. O ESTUDO NÃO ACARRETARÁ NENHUMA DESPESA PARA VOCÊ!

13. CASO VOCÊ TENHA ALGUM DANO por participar da pesquisa receberá indenização.

14. Você receberá uma via do Termo de Assentimento assinado por todos.

15. O estudo poderá ser interrompido caso os pesquisadores percebam algum risco ou danos à saúde do(s) participante(s) da pesquisa ou será suspenso caso seja solicitado pelo Comitê de Ética em Pesquisa com Seres Humanos.

Eu_____ fui convidado a participar da pesquisa, entendi tudo o que foi me explicado sobre a participação no estudo e estou consciente dos direitos, das responsabilidades, dos riscos e dos benefícios, concordo em participar e para isso eu DOU O MEU ASSENTIMENTO SEM QUE PARA ISSO EU TENHA SIDO FORÇADO OU OBRIGADO.

ENDEREÇO DA EQUIPE DE PESQUISA: **Instituição:** Universidade Federal de Alagoas (UFAL), Instituto de Educação Física e Esporte (IEFE). **Endereço:** Campus A.C. Simões Av. Lourival de Melo Mota, S/N. Tabuleiro do Martins - Maceió-AL; CEP: 57072-970. **Telefone:** 3214-1873 **Complemento:** Sala 2 no Complexo Aquático do IEFE	**Contato de urgência**: Prof. Luiz Rodrigo A Lima **Endereço:** Rua Olindina Campos Teixeira, 172, apartamento 201. Edifício Goití. **Cidade/CEP:** 57036-690 **Telefone:** 48 99673 4467 **E-mail:**luiz.lima@iefe.ufal.br

ATENÇÃO: *Se você tiver dúvidas sobre seus direitos como participante de pesquisa, você pode contatar o Comitê de Ética em Pesquisa em Seres Humanos (CEP) da UFAL, pelo telefone: (82) 3214-1041. O CEP trata-se de um grupo de indivíduos com conhecimento científico que realizam a revisão ética inicial e continuada do estudo de pesquisa para mantê-lo seguro e proteger seus direitos. O CEP é responsável pela avaliação e acompanhamento dos aspectos éticos de todas as pesquisas envolvendo seres humanos. Este papel está baseado nas diretrizes éticas brasileiras (Res. CNS 466/12 e complementares).*

O Comitê de Ética da UFAL analisou e aprovou este projeto de pesquisa. Para obter mais informações a respeito deste projeto de pesquisa, informar ocorrências irregulares ou danosas durante a sua participação no estudo, dirija-se ao:

Comitê de Ética em Pesquisa da Universidade Federal de Alagoas - Prédio do Centro de Interesse Comunitário (CIC), Térreo, Campus A. C. Simões,Cidade Universitária.

Telefone: 3214-1041 – Horário de Atendimento: das 8:00hs às 12:00hs. E-mail: comitedeeticaufal@gmail.com

Maceió, de de .

_____ Assinatura ou impressão datiloscópica do responsável legal e rubricar as demais folhas	Prof. Dr. Luiz Rodrigo Augustemak de Lima (Coordenador da Pesquisa)