

UNIVERSIDADE ESTADUAL DE MONTES CLAROS

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Sobrepeso e obesidade: efeito de um programa de intervenção nutricional e relevância do desjejum sobre os parâmetros antropométricos e metabólicos

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Orientador: Prof. Dr. Sérgio Henrique Sousa Santos

Coorientadora: Profa. Dra. Marise Fagundes Silveira

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RESUMO

A obesidade é caracterizada pelo acúmulo excessivo de gordura corporal com potencial prejuízo para a saúde. Estudos epidemiológicos indicam que a alta prevalência de sobrepeso e obesidade, concomitantes com os fatores de risco para a saúde, seja um desafio relevante de saúde pública mundial. Distúrbios psicológicos, sociais e o aumento de risco de doenças de grande morbimortalidade estão relacionados ao sobrepeso e obesidade. O tratamento da obesidade é complexo, pois mais do que a redução ponderal este visa à reestruturação do ambiente alimentar, mudanças comportamentais e estilo de vida. O Programa Nutrição e Saúde, focado na intervenção nutricional individual (INI), é um exemplo de estratégia de recuperação e promoção de saúde. No primeiro estudo foi feita uma INI de 12 semanas com o objetivo de verificar os efeitos dessa INI sobre a perda de peso (PP) e fatores de risco associados com a gênese da síndrome metabólica (SM). A amostra inicial foi composta por 400 indivíduos que foram submetidos a um protocolo de avaliação nutricional (anamnese nutricional, RD24h, avaliação antropométrica e metabólica) e no final T3; no T0 todos os participantes receberam plano nutricional, como também orientações nutricionais específicas de acordo com dados antropométricos, metabólicos e diagnóstico clínico verificados. Os retornos mensais subsequentes foram agendados para o T1, T2 e T3. A adesão à INI até o final do acompanhamento (T3) foi de 237 participantes. O segundo estudo trata da avaliação da associação da ausência do desjejum, refeição café da manhã (CM) ao risco de sobrepeso e obesidade na mesma população avaliada no primeiro estudo (n 400). Os resultados nos permitem demonstrar a relevância da INI como tratamento de primeira linha indicado no controle do sobrepeso, obesidade e comorbidades associadas. A proposta inicial, déficit calórico de 500 a 600 kcal/dia, permitiu uma PP de 6.7% nos homens e 5% nas mulheres, demonstrada através da redução estatisticamente significativa do IMC e também da C.C (obesidade central). Ambos os gêneros apresentaram uma redução estatisticamente significativa nos níveis de glicemia, CT, TG e aumento de HDL-c. Os indivíduos experimentaram uma redução dos fatores de risco individuais para a SM. Concluímos que os presentes resultados indicam que os efeitos da intervenção nutricional sobre a gestão da PP e controle metabólico foram bastante efetivos. Foi verificada associação estatisticamente significativa entre a ausência do CM com o risco de sobrepeso e obesidade. Programas como esse podem ser muito eficazes na prevenção da obesidade e promoção da saúde.

Palavras-chave: Obesidade. Sobrepeso. Intervenção nutricional. Perda de peso. Estilo de vida.

ABSTRACT

Obesity is characterized by the excessive accumulation of body fat with potential harm to health. Epidemiologic studies indicate that the high prevalence of overweight and obesity, along with the risk factors for health, represent a relevant challenge for the world public health. Psychological and social disorders and the increased risk for diseases with high morbimortality are related to overweight and obesity. The obesity treatment is complex, as in addition to the weight loss target, the treatment aims to reorganize the dietary environment and promote behavioral and lifestyle changes. The nutritional and health program, focused on the individual nutritional intervention (INI), is an example of recovery strategy and health promotion. In the first study, the effects of a 12 week INI on the weight loss and risk factors associated with the metabolic syndrome genesis were evaluated. The initial sample was comprised of 400 participants that were submitted to a nutritional evaluation protocol (nutritional anamnesis, RD24h, anthropometric and metabolic evaluation) at baseline and T3 (after 12 weeks). At T0 all participants received a nutritional plan, as well as specific nutritional orientations according to the verified anthropometric and metabolic parameters and clinical diagnosis. The monthly follow ups were scheduled at T1, T2 and T3. 237 participants adhered to the INI until T3. The second study evaluated the association between the absence of breakfast and the risk of developing overweight and obesity on the same population evaluated in the first study (n=400). The main findings demonstrate the relevance of the INI as a first line treatment indicated for overweight, obesity and associated comorbidities management. On the initial proposal, the calorie deficit of 500 to 600 kcal/day, allowed a weight loss of 6.7% in males and 5% on females, demonstrated through the BMI and WC decrease. Both genders displayed reduced levels of glucose, CT, TG and increased HDL-c. The participants experienced a statistically significant reduction on the individual risk factors for MetS. Therefore, the present results points to the nutritional intervention effectiveness on weight loss and metabolic control. In addition, a significant association between the absence of breakfast and risk to develop overweight and obesity was observed. Similar programs may be effective on the obesity prevention and health promotion.

Key-words: Obesity. Overweight. Nutritional intervention. Weight loss. Lifestyle.

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1 INTRODUÇÃO

A obesidade é caracterizada pelo acúmulo excessivo de gordura corporal com potencial prejuízo para a saúde (1), e é considerada atualmente como uma epidemia mundial, pois a prevalência de sobrepeso e obesidade está aumentando de forma alarmante em todo o mundo (2). Estudos epidemiológicos indicam que a alta prevalência de sobrepeso e obesidade, concomitante com os fatores de risco para a saúde, seja um desafio relevante de saúde pública mundial (3). A epidemia da obesidade tem crescido tanto em países desenvolvidos quanto nos subdesenvolvidos, entre todos os segmentos da sociedade.

Em 2008, segundo a Organização Mundial da Saúde (OMS), 1,5 bilhão de adultos estavam com sobrepeso. Destes, mais de 500 milhões foram classificados como obesos (4). No Brasil, segundo dados obtidos de 188 mil brasileiros através da Pesquisa de Orçamentos Familiares (POF) 2008/2009, a obesidade e o excesso de peso têm aumentado rapidamente nos últimos anos, em todas as faixas etárias. Nessa pesquisa, 50% dos homens e 48% das mulheres se encontram com excesso de peso, sendo que 12,5% e 16,9% destes apresentam obesidade respectivamente (5). Dados epidemiológicos mais recentes do Vigitel (Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico) - 2014, revelam que esses números estão em ascensão – 52,5% dos homens e 56,5% das mulheres se encontram com excesso de peso, sendo que 17,9% de ambos os sexos apresentam obesidade. O excesso de peso acomete um em cada dois adultos e uma em cada três crianças brasileiras (6).

O índice de Massa Corporal (IMC) é o indicador epidemiológico para o diagnóstico do sobrepeso e da obesidade. A OMS define sobrepeso e obesidade como um IMC acima de 25 Kg/m^2 e 30 Kg/m^2 respectivamente (7), baseando-se em padrões internacionais desenvolvidos para pessoas adultas descendentes de europeus, pois não existem estudos de coorte nacional para definir os limites para a população brasileira (8). As diretrizes publicadas em 2010 pela Associação Brasileira para o Estudo da Obesidade e da Síndrome Metabólica consideram que, no geral, não é difícil reconhecer a obesidade ou até mesmo o sobrepeso, porém, o diagnóstico correto requer a identificação dos níveis de risco. Tal identificação necessita, frequentemente, de algumas outras formas de quantificação, o que torna necessário entender que o IMC, apesar de ser muito utilizado, não está totalmente correlacionado com a gordura corporal (8, 9). As principais limitações desse método são: não distinguir a massa gordurosa da massa magra; não refletir, necessariamente, a distribuição da gordura corporal; não indicar,

necessariamente, o mesmo grau de gordura em populações diversas, particularmente devido às diferentes proporções corporais entre os indivíduos (9-11).

Nesse contexto, a obesidade abdominal ou central, com base na circunferência da cintura (CC), é melhor preditor para apontar os efeitos mais adversos para a saúde do que a obesidade geral, determinada pelo IMC (11, 12). A aferição da circunferência abdominal é, portanto, o método antropométrico que reflete de forma indireta o conteúdo de gordura visceral.

A aferição é feita no ponto médio entre o rebordo costal inferior e a crista ilíaca. Entretanto, os valores de cintura abdominal que determinam o risco cardiometabólico variam dependendo da população estudada. As primeiras recomendações norte-americanas estabeleceram os valores de 102 cm para homens e 88 cm para mulheres como pontos de corte. Em outras populações, níveis menores – 94 cm para homens e 80 cm para mulheres – têm sido considerados mais apropriados. Na população brasileira, alguns estudos indicam que esses níveis são bons preditores de risco para doenças metabólicas, principalmente hipertensão arterial (8, 9). Inúmeros estudos também já demonstraram que a obesidade abdominal está mais relacionada ao risco de doenças graves e também à maior mortalidade do que a obesidade glúteo-femoral, independentemente da gordura corporal total (9, 13, 14).

O aumento da prevalência de sobrepeso e obesidade afeta significativamente os indicadores de morbimortalidade e os gastos com serviços de saúde (15, 16). Portanto, prediz um aumento de várias doenças, principalmente as doenças crônicas não transmissíveis (DCNT), sendo inegável a ligação entre as taxas crescentes de obesidade e o aumento dos custos com assistência à saúde (17). Sendo assim, há uma relação bem estabelecida entre obesidade e as complicações para a saúde (3) que podem ser representadas por distúrbios psicológicos, sociais, aumento do risco de morte prematura e o aumento de risco de doenças de grande morbimortalidade, como *diabetes mellitus* (DM), hipertensão arterial sistêmica (HAS), dislipidemias, doenças cardiovasculares (DCV), esteatose hepática não alcoólica (NAFLD) e câncer (18).

Claro está que quanto maior o excesso de peso maior é a gravidade da doença (19). Das complicações da obesidade, a mais prevalente e de maior risco na sociedade moderna é o DM que pode ser diretamente correlacionado ao aumento do IMC – quando esse índice encontra-

se acima de 35kg/m² aumenta-se o risco do seu desenvolvimento em 93 e 42 vezes no gênero feminino e masculino respectivamente (20).

No Brasil, as DCNT concentram 72% do total de óbitos segundo dados de 2009 do Sistema de Informação de Mortalidade – percentual que representa mais de 742 mil mortes por ano. As que mais matam são as DCV (31,3%), o câncer (16,2%), as doenças respiratórias crônicas (5,8%) e o DM (5,2%). Todas essas condições estão relacionadas, em maior ou menor grau, com a presença de obesidade (17). As doenças DCV e DM, ambas com alta morbidade e mortalidade, são responsáveis por custos elevados e um número significativo de internações no Brasil (17, 21). Condições essas que, provavelmente, poderiam ter a sua prevalência e gravidade reduzidas com a redução das taxas de obesidade (21).

Comparando-se ainda pessoas de peso normal, homens com 20% acima do peso desejável têm 20% a mais de chance de vir a morrer do que a população eutrófica de mesma faixa etária; possuem risco duas vezes maior de falecer por diabetes; as chances de desenvolverem disfunções na vesícula biliar e doenças coronarianas aumentam em 40% e 25% respectivamente. Já em homens com peso 40% acima do desejável a mortalidade é 55% maior do que na população eutrófica na mesma faixa etária, sendo 70% maior a chance de desenvolverem doenças coronarianas, e com o risco de morte por diabetes quatro vezes maior (18). O estudo de Wang *et al.* projetou as tendências do peso econômico da obesidade nos Estados Unidos da América (EUA). Tal estudo demonstrou que um programa que permite uma redução hipotética de 1% do IMC em toda a população dos EUA evitaria até 2,1-2,4 milhões de casos incidentes de DM, 1,4-1,7 milhões de DCV, e 73-127 mil casos de câncer (21).

No Brasil, o impacto econômico do excesso de peso pode ser verificado no estudo realizado por Oliveira, onde ele mostra que a estimativa de custos decorrentes da obesidade pelo sistema público de saúde brasileiro foi de quase meio bilhão de reais em 2001, custos estes que tiveram somados os gastos da obesidade e os gastos das comorbidades associadas, que poderiam ter sido evitadas se a obesidade tivesse sido prevenida (22). Já no período entre 2008-2009, foi constatado que 1,55 milhão de adultos apresentavam obesidade grau 3 (grave), totalizando 0,81% da população do país, com maior prevalência na Região Sul, nas mulheres e em pessoas de raça negra (5). Em 2011, os custos atribuíveis à obesidade no Sistema Único de Saúde (SUS) totalizaram R\$ 487,98 milhões representando 1,9% dos gastos com

assistência à saúde de média e alta complexidade. Os custos especificamente da obesidade grave perfizeram 23,8% dos custos – R\$ 116,2 milhões, apesar de sua prevalência ser 18 vezes menor. Os custos com a cirurgia bariátrica no Brasil foram de R\$ 31,5 milhões. A obesidade grave tem seu custo proporcionalmente 4,3 vezes maior do que o da obesidade não grave (22).

A gênese da obesidade é multifatorial, envolvendo fatores genéticos, ambientais e estilo de vida mediada por fatores sociais, econômicos, endócrinos, metabólicos e psiquiátricos (23-25) Está bem documentado na literatura que a obesidade é causada por um desequilíbrio entre a ingestão e o gasto de energia, no entanto, existem vários fatores, complexos que influenciam esta equação (25, 26). O estudo de Anderson *et al.* demonstra que gestores de saúde pública reconhecem que o aumento da obesidade nos EUA ocorreu muito rapidamente para ter como bases principais as causas genéticas ou biológicas, o que levou os cientistas a analisarem mudanças sociais, políticas e o sistema de produção de alimentos, incluindo mudanças no ambiente alimentar, como fatores chaves desencadeantes da atual epidemia da obesidade (27).

O desequilíbrio energético que tem sido associado com a gênese da obesidade pode ser explicado pelas mudanças observadas no processo de transição nutricional que caracteriza-se por alterações no padrão alimentar da população, uma grande oferta de alimentos de baixo custo, altamente palatável, densamente energéticos, como bebidas calóricas (refrigerantes) e produtos alimentícios processados (27-29). Dessa forma, os estudos da área de nutrição demonstram claramente que a mudança comportamental verificada no âmbito do padrão alimentar inclui o aumento na ingestão de lipídios de origem animal, carboidratados de alto índice glicêmico e baixo consumo de alimentos in natura, de cereais e fibras (30-32). Paralelamente, a diminuição do gasto energético relacionada à inatividade física é um fator importante que contribui para a obesidade (30, 33-35).

Considerando-se a cesta média de compras do brasileiro, pode-se perceber que até a última pesquisa POP, realizada em 2008/2009, houve diminuição na compra de alimentos *in natura* ou minimamente processados (verduras, frutas, cereais principalmente, carnes, leite) e também diminuição dos ingredientes culinários como sal, açúcar e óleo. Mas, em contrapartida, houve aumento na aquisição de alimentos prontos para consumo, ultraprocessados (ricos em gorduras trans, açúcar e sal), incluindo bolos, produtos panificados, refrigerantes, sucos artificiais, pratos congelados, carne processada (pronta para o

consumo) e etc. Verifica-se que houve substituição de alguns tipos de alimentos e, portanto, o consumo em excesso de açúcar e gorduras não pode ser visto como único responsável pela obesidade aqui no Brasil. Analisando essas pesquisas, percebe-se que o brasileiro está comprando menos açúcar, óleo e sal, mas verifica-se que continua aumentando a prevalência da obesidade e o desenvolvimento de mais HAS. Claro está que houve uma migração das preparações culinárias, refeições preparadas em domicílios com alimentos *in natura* ou minimamente processados, para a adoção de alimentos ultraprocessados (5, 6).

Portanto, pode-se concluir que o tratamento da obesidade é complexo e deve pautar-se em ações conjuntas propostas por equipe multiprofissional e interdisciplinar, pois, mais do que a redução ponderal, este visará a reestruturação do ambiente alimentar, mudanças comportamentais e no estilo de vida ao longo da vida (27, 36). Embora passíveis de prevenção, os dados epidemiológicos apontam para um importante potencial de crescimento de um estilo de vida inadequado em sociedades menos e mais desenvolvidas, o que tem demandado de autoridades e de profissionais de saúde uma série de medidas, principalmente educativas, para tentar controlar o problema (3, 36, 37).

No Brasil, para o enfrentamento deste problema, o Guia Alimentar para a População Brasileira traz as diretrizes alimentares oficiais que evidenciam a necessidade da ampliação de ações intersetoriais que repercutam positivamente sobre os diversos determinantes da saúde e nutrição. Neste contexto, o setor de saúde tem importante papel na promoção da alimentação adequada e saudável, compromisso expresso na Política Nacional de Alimentação e Nutrição e na Política Nacional de Promoção da Saúde. A promoção da alimentação adequada e saudável no SUS e também em outros setores deve fundamentar-se nas dimensões de incentivo, apoio e proteção da saúde combinando iniciativas focadas em políticas públicas que propiciem a criação de ambientes saudáveis, no desenvolvimento de habilidades pessoais e na reorientação dos serviços de saúde na perspectiva da promoção da saúde (38).

O programa Nutrição e Saúde, focado na intervenção nutricional individual, adotado neste estudo é um exemplo de estratégia de educação em saúde, que tem como objetivo proporcionar aos participantes informações e habilidades práticas para ajudá-los a repensar o ambiente alimentar, alcançar as recomendações dietéticas ideais e mudança no estilo de vida. As ações de educação nutricional visam redução moderada na ingestão energética como estratégia para a perda de peso corporal, massa gorda (36, 39) e prescrição dietética com

composição nutricional adequada visando melhor controle metabólico (40-42). Com a prática de atividade física aliada às mudanças nos hábitos alimentares e de estilo de vida pode-se alcançar, de forma eficaz, a manutenção do peso ao longo da vida (43). Essas estratégias também correspondem às principais formas de tratamento não farmacológico da obesidade (36, 39).

Faz-se necessário incluir importantes fatores nos programas de intervenção nutricional que visam à mudança do comportamento alimentar. Como, por exemplo, o treinamento profissional para aquisição de habilidades técnicas que motivem os indivíduos no sentido desejado. Na avaliação do consumo e prescrição nutricional uma abordagem holística é imprescindível para enfrentar o desafio de motivar os indivíduos para a adoção de uma alimentação saudável (39, 44).

A OMS adota como definição de adesão a tratamentos crônicos uma fusão de ações que podem ser sintetizadas como o grau de comprometimento ou aceitação da pessoa em submeter-se às recomendações de um médico ou outro profissional de saúde, tais como a ingestão de medicamentos, seguimento da dieta e mudanças no estilo de vida (45). A ampliação do conhecimento sobre os inúmeros determinantes do comportamento alimentar é uma importante ferramenta para superar o desafio de transformar informações científicas de nutrição em mudanças reais das práticas alimentares (39), pois para que a educação nutricional alimentar atinja os resultados esperados é necessária a adesão do indivíduo à terapêutica. A obesidade, por ser uma doença crônica, exige tratamentos de longa duração que, em geral, apresentam menor adesão, visto que os esquemas terapêuticos exigem um grande empenho do paciente que necessita modificar seus hábitos de vida para alcançar uma melhora do quadro (33, 36). Logo, considerando o impacto do comportamento alimentar na saúde, verifica-se a necessidade do desenvolvimento de estratégias de intervenção nutricional de sucesso para facultar a adesão dos pacientes às práticas alimentares saudáveis.

Diante do exposto, o presente estudo tem como objetivo avaliar os efeitos de um programa de intervenção nutricional, com foco na modificação dietética e comportamentos alimentares, sobre as variáveis antropométricas, metabólicas e fatores de risco relacionados ao sobrepeso e obesidade. Os participantes incluídos neste estudo eram colaboradores da Universidade Estadual de Montes Claros – UNIMONTES, atendidos no ambulatório de Nutrição Clínica / Centro Ambulatorial de Especialidades Tancredo Neves – CAETAN da referida universidade.

O Programa Mudança de Hábito e Estilo de Vida/Nutrição e Saúde foi implantado nesta instituição no final de 2011 visando melhorar a qualidade de vida dos seus colaboradores com foco na reeducação dietética, mudanças de hábitos e estilo de vida.

2 OBJETIVOS

2.1 Objetivo geral

Analisar o efeito de um programa de intervenção nutricional sobre os parâmetros antropométricos e metabólicos na recuperação e promoção da saúde de indivíduos com sobrepeso e obesidade.

2.2 Objetivos específicos

- Avaliar e diagnosticar o estado nutricional através de parâmetros antropométricos e metabólicos.
- Conhecer as práticas alimentares e os hábitos de vida dos participantes do programa.
- Avaliar o efeito da intervenção nutricional na perda de peso e nos fatores de risco associados com a gênese da síndrome metabólica.
- Avaliar a associação de sobrepeso e obesidade à ausência da refeição café da manhã.

3 PRODUTOS

Os produtos foram dois artigos científicos

3.1 Produto 1: *Effects of a nutritional intervention program on weight loss and risk factors associated with the genesis of the metabolic syndrome in Brazilian adults*, formatado segundo as normas para publicação no periódico British Journal of Nutrition em processo de submissão.

3.2 Produto 2: *Nutritional status associated to skipping breakfast in Brazilian health service patients*, formatado segundo as normas para publicação no periódico Annals of Nutrition and Metabolism, aceito para publicação em 23/05/16.

3.1 Produto 1

Effects of a nutritional intervention program on weight loss and risk factors associated with the genesis of the metabolic syndrome in Brazilian adults

Short title: Nutritional intervention reverses metabolic syndrome

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Author contributions

The authors G.C.B. Jorge, A.S.B. Jorge and M.F. Silveira contributed to the design of the study, the acquisition, analysis and interpretation of the data. The authors G.C.B. Jorge and D.F. Lelis contributed to drafting the article and revising it critically for important intellectual content, and the authors Alfredo Maurício Batista de Paula, André Luiz Sena Guimarães and Sérgio Henrique Sousa Santos contributed to the final approval of the version to be submitted.

ABSTRACT

The high prevalence of overweight, obesity and metabolic syndrome (MetS) are major concerns of the world public health. The treatment of obesity besides weight loss (WL), requires changes of the dietary environment and lifestyle. The aim of the present study was to evaluate the effects of an individualized nutritional intervention (INI) on the weight loss and risk factors associated with the MetS. 400 individuals were enrolled in a 12 week (T0 to T3) INI, being the participants evaluated before (through nutritional anamnesis, RD24h, anthropometric and metabolic evaluation) the diet plan delivery at T0 and after this period, with final adherence of 237 participants. Anthropometric and biochemical parameters were described by the mean and standard deviation according to gender, at baseline and T3, where the data normality was evaluated by the Kolmogorov- Smirnov test that showed normal distribution. Thus, non-parametric tests were performed. Mann-Whitney test was applied to compare variables between genders, Wilcoxon test to compare differences between baseline and T3 and McNemar chi-square test to compare the use of antihypertensive medications at baseline and T3. Significance level was set as 0.05. The calorie deficit of 500 to 600Kcal/day promoted a WL of 6.7% in males and 5% in females (decreased BMI and WC). The INI promoted statistically significant reductions on the glucose, CT and TG levels and increase in the levels of HDL, along with a decrease of the individual risk factors for MetS in females and a few males. We conclude that the INI effects were effective on the weight loss management and metabolic control.

Keywords: Nutritional intervention; obesity; weight loss; metabolic syndrome; lifestyle

INTRODUCTION

The World Health Organization (WHO) defines obesity as a chronic disease caused by a complex interaction of genetic, environmental and lifestyle factors ^(1; 2). More than half of all global deaths in 2010 were associated to noncommunicable diseases (NCDs), including obesity, diabetes, cancers and cardiovascular diseases. Studies suggest that the alarming increase of the NCDs is the epidemiological result of a dietary transition, characterized by dietary patterns marked by increased fat, cholesterol, sugars and other refined carbohydrates intake, along with a decreased consumption of unsaturated fatty acids and fibers ⁽³⁾.

It is noteworthy that the body fat distribution may reveal an individual predisposition to the development of complications, being widely known that the central adiposity is associated to metabolic disorders and cardiovascular risk ^(1; 4). The Metabolic Syndrome (MetS), for example, is a complex state, represented by a cluster of cardiovascular risk factors associated to central fat deposition and insulin resistance ^(5; 6). The primary prevention of MetS is a contemporaneous world challenge, with important health repercussions ⁽⁷⁾, being the inadequate dietary pattern, ⁽⁸⁾, physical inactivity ⁽⁹⁾ and genetic predisposition ⁽¹⁰⁾ among the main factors that contribute for the MetS development.

It is known that a lifestyle change, focusing on a diet quality improvement and physical activity is the first option treatment for the MetS components control and its comorbidities ⁽¹¹⁾, being the weight loss the key for the improvement of all MetS aspects ⁽¹²⁾.

Up to date, most of the researches agree that overweight and obesity are caused by several factors; however, the long-term energy imbalance between energy expenditure and intake seems to be the primary cause ⁽¹³⁾. Therefore, to limit the energy intake would be a fundamental goal when the objective is to lose body weight and fat, aiming to improve the metabolic profile, risks of cardiovascular diseases and premature death ⁽¹¹⁾. The studies have been suggesting a series of benefits of diets rich in vegetables and fruits, which help the individuals to achieve a healthy weight ^(11; 14). Diets based on vegetables and fruits typically have low calorie content and promote a rich offer of fibers and phytochemical nutrients that are essential to health promotion. The science advances on nutrition and the public health data highlights the potential

benefits of the intake of these nutrients ⁽¹²⁾. However, to adopt and maintain a healthy lifestyle, with natural food and lean meats seem to be a difficult choice to several participants, even when they are aware of its benefits ⁽¹²⁾.

It is well documented in the literature that the attempts to improve diet quality are very often unsuccessful due to the low adherence of participants to lifestyle changes ^(15; 16). In addition to the intervention modalities, a variety of individual factors may influence the capacity of maintenance of dietary changes. Indeed, the dietary environment ⁽¹⁷⁾, the individual preferences on the food selection, and the preparing and consumption of the meals, are variables associated with socio-economic levels, education and lifestyle, as well as the factors that include physical activity; which doubtlessly develop a relevant role in the adherence and maintenance of diets in a long-term ^(11; 14).

In this context, the present study aimed to evaluate the effects of a nutritional intervention program on weight loss and risk factors associated with the genesis of MetS in Brazilian adults, which may contribute to improve diet therapeutic intervention strategies target to fight this type of morbidity in populations with similar characteristics of the present study.

SUBJECTS AND METHODS

Study population

The participants included in this study were attending the Lifestyle Changing Program – “Nutrition and Health”, in the period from January 2013 to February de 2015, in the ambulatory of the Nutrition Clinic/Tancredo Neves Ambulatory Specialties Center - CAETAN/ Universidade Estadual de Montes Claros - UNIMONTES located in Montes Claros, Minas Gerais, Brazil. All the individuals are employees of the Universidade Estadual de Montes Claros that were interested in participating in the “Nutrition and Health program”, which is aimed to improve the quality of life of the employees, changes of habit and lifestyle, by focusing in the dietary reeducation. These patients constitute a universe of 2400 UNIMONTES employees.

The following parameters were considered for the sample size calculations: percentage of 50% for the occurrence of overweight\obesity, confidence level of 95% and an error rate of 5%. The calculations evidenced the need to evaluate 384 patients.

For the patient's selection, a nonprobability sampling was applied, being considered the spontaneous demand of the patients who requested the Clinical Nutrition Service. The inclusion criteria were: Age superior to 18 years old, the absence of pregnancy, not have been submitted to bariatric surgery and not under use of anorexigenic drugs.

A total of 413 patients requested the Clinical Nutrition Services, and out of these, 13 did not attend the inclusion criteria (05 pregnant, 04 patients submitted to bariatric surgery and 04 patients under use of anorexigenic drugs). Therefore, 400 patients were enrolled in the study.

Additionally, in this study, participants undergoing treatment for hypertension (self-reported use of antihypertensive medication) or diabetes were automatically classified as presenting those conditions.

Subjects gave their written consent to participate in the study, which was approved by the Ethics Committee of the Universidade Estadual de Montes Claros, by the process number 152 337.

Study design

This is a longitudinal quasi-experimental study with evaluations at baseline; time 0 (T0) to time 3 (T3) after 12 weeks of dietary intervention based on nutritional counseling. Subsequent follow ups were monthly set up on times T0 to T3. It was considered abandonment (non-adherence to the nutritional intervention program) when the patient did not return to the monthly nutritional follow up and consequently did not participated in the final evaluation at T3.

The following characteristics were evaluated at baseline: sociodemographic -gender, age, educational level, work shifts and civil state; behavior and habits - physical activity, alcoholic consumption and meals frequency/day; nutritional status - overweight/obesity, waist circumference (WC), Hip circumference (HC) and waist-hip-ratio (WHR); biochemical and clinical parameters - fasting glucose, total cholesterol, LDL cholesterol, HDL cholesterol and triglyceride levels and presence or absence of arterial hypertension (considering the use of oral antihypertensive).

Biochemical and anthropometric data, and dietary intake were assessed at baseline and T3. At time 4 (T4) the conduction of the nutritional intervention was set up as follows: patients who achieved their healthy weight goal received a maintenance

dietary proposal and were advised about the continuous adoption of lifestyle change (diet, physical activity and behavioral changes) and were also encouraged to continue participating in the program with quarterly returns aiming to guarantee that the weight loss achieved would be maintained in a long term. The patients who did not achieve their healthy weight goal were instructed to continue in the program with monthly set up returns. The patients that did not return on T3 were contacted and formally invited to return into the program.

Anthropometric measurements

Body weight was measured in kilograms (kg) in an electronic scale Balmak, Model BK-50FA (minimum capacity of 1 kg and a maximum of 150 kg, sensitivity of 50g and calibrated by the Institute of Weights and Measures) with the participants in typical indoor clothing without shoes. The height (m) was determined to the nearest 0.1cm, with the participants standing upright against an aluminum stadiometer (Model BK-50FA), coupled to the scale (maximum capacity of 200cm, with intervals of 0.5cm, without shoes).

The overall nutritional status was defined based on the Body Mass Index (BMI), according to the World Health Organization ⁽¹⁸⁾.

For the WC analysis, an inelastic tape was used, with a scale of 0.5cm placed without pressure at the smallest circumference between the bottom of the last rib and the iliac crest ^(1; 19; 20). For values higher than or equal to 80 cm for females, the WC was classified as increased, and greater than or equal to 94 cm for males. The WC was classified as very increased when greater than or equal to 88 cm for females and 102 for males ⁽¹⁹⁾. The Hip circumference (HC) was measured horizontally at the level of the largest lateral extension of the hips or over the buttocks ⁽⁴⁾.

Having said that, in this study the participants were classified in the following groups: overweight: $BMI \geq 25$ and < 30 kg/m² and obese as $BMI \geq 30$ kg/m² ⁽²⁾.

Biochemical measurements and metabolic syndrome

Specific enzymatic Elisa Kits (DSA BioELISA, USA) were used for the assessment of the serum levels of fasting glucose ⁽²¹⁾, total cholesterol (TC), high-density lipoprotein cholesterol (HDL-c), low-density lipoprotein cholesterol (LDL-c), and triglycerides (TG) ^(22; 23). The participants were previously advised to do not perform vigorous physical exercises 24-hours and/or consume alcohol 72-hours prior to blood collection. The determination of dyslipidemias involves changes in isolation or together of the four measured parameters ⁽²²⁾. The biochemical exams were performed at the Clinical Analysis laboratory in Hospital Universitário Clemente de Faria/UNIMONTES.

For diagnosis of MetS, the criteria described in NCEP-ATP III were adopted for the evaluation of the individual risks of developing MetS in male and female ⁽⁶⁾.

Physical activity assessment and lifestyle

Regarding the levels of physical activity practiced by the participants enrolled in this study, which was measured by the total time of physical activity during the week, the participants were classified as follows: active: when they practice the equivalent of minutes or more of moderate physical activity and insufficient active: when they practice less than 150 minutes ⁽²⁴⁾. All the participants were encouraged to adopt a physical exercise plan with the responsible physician consent, and monitoring of a professional.

The participants were also questioned about other lifestyle habits, such as alcoholic consumption (quality and frequency) and work shift (the predominant workshift over the year).

Dietary intake and dietary intervention

The dietary intervention consisted on the individualized diet preparation at T0, where all participants spent about 45 minutes (45 to 60 min) with a dietitian learning the basics of the diet.

The food anamnesis was performed at baseline and T3, from the dietary history and from two 24-hour dietary recall (24HDR) (in 2 different days, 1 from Monday to Friday and 1 from Saturday to Sunday) aiming to evaluate the food intake, identifying the schedules and meals frequency, quantity in household measures, eating habits and possible intolerances and/or allergies.

The first step for the nutritional therapy (NT) development was to define the nutritional diagnosis through the joint analysis of information, as the clinical diagnosis, evaluation of the food anamnesis and by determining the anthropometric and metabolic parameters. Next, the nutritional individual needs were established. The NT (diet) provided a total calorie value (TCV) consistent with the obtainment and/or maintenance of the healthy body weight. This evaluation was individualized and predicted sustained weight reduction of 5% to 10% of the initial body weight ⁽¹⁶⁾. The patients with body weight excess received hypocaloric diets with reductions of 500Kcal or more of the estimated energy requirement (EER) predicted or related to dietary history. The method used for the calculations of EER considered from 20kcal to 25kcal/kg current weight/day with the goal to promote ponderal losses of 0.5 kg/week ^(16; 25).

The eating plan was based on the following recommendations: carbohydrates, 50% to 55% of total calories, with an emphasis on complex carbohydrates; fibers, 20 to 30 g/day; total fat, 25% to 35% of total calories; saturated fatty acids, < 7% of total calories; polyunsaturated fatty acids, up to 10% of total calories; monounsaturated fatty acids, up to 20% of total calories; cholesterol, < 300 mg/day ⁽²⁶⁾; proteins, 0.8 - 1.0 g/kg current weight/day or 15% of total calories micronutrients, in accordance with the recommendations of the Dietary Reference Intakes (DRIs) ^(7; 27). All participants were prescribed 20 g of oatmeal and linseed respectively in the daily dietary proposal ⁽²⁸⁾.

The meals frequency consisted of 5-6 meals/day, balanced distributed and aiming to attend the individualized nutritional recommendations. The relevance of breakfast was emphasized for a better metabolic control ⁽²⁹⁾.

The adequate NT was oriented based on the Mediterranean Diet (MD) model ⁽²⁷⁾. Dietitian emphasized the following points of the nutrition education material to participants: diet rich in vegetables, fruits (5 servings/day), whole grains, virgin olive oil, lean meats, red meat (< 2 times/week), oleaginous (1 Brazil nut and 3 walnuts/day), teas rich in antioxidants and polyphenols (approximately 2 cups/day), water (> 2

liters/day), low fat dairy foods, and foods rich in magnesium, potassium, calcium and fiber – but respecting and contemplating the culture, regional, social and economic particularities, oriented to be palatable to taste and visually attractive. The further specific nutritional orientations and the list of replacement food were handled along with the nutritional proposal at T0. The participants with the habit of consuming alcoholic drinks, were advised to do not overpass the recommended limit of 30g ethanol/day for males and 15g of ethanol/day for females (they were advised about the dry red wine option). Each case was evaluated according to the clinical diagnosis ⁽⁷⁾.

All prescribed diets were calculated, with the support of the software “Programa de Apoio à Nutrição – Version 2.5 Dis / UNIFESP – Escola Paulista de Medicina”.

Statistical Analysis

Individuals participating in the study were described according to their demographic characteristics, food consumption habits, behavior and nutritional status (The socio-demographic, habits and nutritional status characteristics were described through its distributions of frequency at baseline). The anthropometric variables and biochemical parameters were described by the mean and standard deviation according to the gender, at baseline and T3. The normality of these variables was evaluated by applying the Kolmogorov-Smirnov test, which demonstrated that they follow a normal distribution. Thus, non-parametric tests were applied. Mann-Whitney test was applied to compare variables between males and females. Wilcoxon test was used to compare the differences between baseline and T3. In order to compare the proportion of participants under use of antihypertensive medication between baseline and T3, the McNemar chi-square test was applied.

The significance level at this stage was 0.05. All analyzes were performed using Predictive Analytics Software (PASW) version 17.0 for Windows software.

RESULTS

At baseline the sample size consisted of 400 patients. The majority of the patients were female (80.2%). Concerning the age, 52.6% of the participants were aged

from 18 and 40 years old, the mean age for females was 40.2 (SD=9.9) years old (min 19; max 60) and 38.4 (S.D=10.2) years old for males (min 24; max 56). Males and females included in our study were of similar age. The further demographic and habits\behavior characteristics are presented on Table 1, according to the participant's gender.

The participant's characteristics at baseline were not statistically different between males and females, except regarding work shifts, alcohol consumption, and BMI $IMC \geq 30$ kg/m² (Table 1).

On table 2, the baseline means and standard deviations of the biochemical parameters (Glucose, TC, HDL-c, LDL-c, TG) and body composition (BW, BMI, WC, HC and WHR) according to gender, are presented. The males included in our study presented higher levels of glucose, low fraction levels of HDL-c, increased levels of TG, higher BW, BMI, WC and WHR as compared to females. Noteworthy that the mean BW at the beginning of the baseline program was 71.9kg (SD = 13.8) and 90.4kg (SD = 16.6) respectively in females and males ($p < 0.0001$). The TC, LDL-c and HC between males and females did not present statistically significant differences.

Table 3 shows the results regarding the metabolic parameters and body composition at baseline and T3 for the participants who joined the nutritional follow up. After 12 weeks of dietary intervention based on nutritional counseling, from the 79 males and 321 females included in this study, an adherence of 49 (62%) of males and 188 (58.8%) of the females which in fact concluded the program, was observed.

Regarding the metabolic parameters, it is observed that the participants had a significant reduction on the levels of glucose, TC and TG as well as a significant increase in the HDL-c levels from the baseline to post-intervention (Table 3).

The participants also presented statistically significant reductions on the anthropometric parameters (BW, BMI, WC and WHR) at T3 as compared to baseline ($p < 0.0001$). The BW mean was significantly reduced at the end of 12 weeks of intervention. At baseline, the BW of females was 74Kg (SD=14.2) and 70.4kg (SD=13.3) at T3. For males, the BW mean was 90.7kg (SD=17.0) at baseline and 84.6kg (SD=15.0) at T3. The BMI analysis evidenced a reduction from 1.5kg/m² to 2.0kg/m² in females and males respectively, which is sufficient for them to leave the BMI limit classification for overweight and obesity, characterized by an BMI ≥ 30

kg/m². The WC evaluations showed a significant reduction of 4.9cm on average, from 87.1cm (SD=12.3) to 82.2cm (SD=10.9), and a reduction of 6.4cm on average, from 101cm (SD=10.1) to 94.6cm (SD=9.5) on females and males respectively. In addition, a significant reduction of WHR was observed for both males and females (Table 3).

The food anamnesis/RD 24h performed at T3, regarding the dietary habit of having 5-6 meals/day, evidenced an adherence increase from 30.9% to 62.2% and from 30.6% to 69.4% respectively in females and males. Additionally, the habit of practicing physical activity was shown to raise from 21.8% to 45.7% and 32.6% to 67.3% in females and males respectively.

Finally, regarding the risk factors of MetS, from baseline to T3, it was observed a significant difference in females on the proportions of WC >88cm; TG ≥150 mg/dL; HDL-C < 50 mg/dL; glucose ≥ 110 mg/dL and blood pressure. However, among the males, significant differences were only observed on WC > 102 cm; HDL-C < 40 mg/dL and blood pressure (Graph 1).

DISCUSSION

The main findings of the present study showed that the individualized nutrition intervention promoted weight losses of 6.7% in males and 5% in females (decreased BMI and WC) and statistically significant reductions on the glucose, CT and TG levels and increase in the levels of HDL in addition to decreased individual risk factors for MetS.

It is well established that overweight and obesity leads to metabolic disorders and increased mortality. The lifestyle intervention therapy, based on dietary changes, increased physical activity and behavioral changes should be preferable; leaving the drug intervention for a second choice ^(15; 16) The national and international guidelines suggest the use of drug therapy in association with the conservative treatment during the clinical management of obesity and overweight in patients with: BMI ≥30 kg/m² or ≥25 kg/m² associated with other risk factors, such as arterial hypertension, type 2 DM, sleep apnea, osteoarthritis, arthritis, among others, or patients with WC ≥102cm (males) and 88cm (females) ^(16; 30).

In this context, the present study corroborates for the relevance of the nutritional intervention as a first-line treatment indicated for the control of obesity and overweight and associated comorbidities ^(11; 12; 13). On the initial NT proposal, a calorie deficit of 500 to 600 kcal/day, would allow the achievement of a weight loss of approximately 0.5 kg/week in a period of 12 weeks (max 24 weeks) ⁽¹⁶⁾. Therefore, the total weight loss expected would be a mean of 5.4 kg/individual at T3. In this study, this average of weight loss was successfully achieved (6.7% for males and 5% for females). Thus, the participants adherence to the dietary intervention showed to be satisfactory.

Epidemiologic studies generally use the BMI as an indicator of body weight (BW) excess and obesity. Furthermore, the international definitions of overweight and obesity in adults are based on the BMI as the BW and height can be measured in a relatively simple and precise manner. However, the BMI does not predict the body composition directly and since obesity refers to an increase in the body adiposity, the underlying assumption of using the BMI to define obesity is that at a given height, an elevated weight is associated with increased fat. However, partly because of the limitations of BMI, the use of other simple measures to assess adiposity such as WC and the WHR, has also been suggested ⁽³¹⁾. The weight loss was demonstrated through the decrease of BMI, general obesity, and also by a significant reduction in the central obesity and WC. Previous studies show that WC is the best predictor for risk factors associated to obesity and cardiovascular diseases, as compared to BMI ^(14; 15; 32).

These results are explained by the relationship between the decrease in abdominal obesity and improvement of risk factors for cardiovascular diseases. In general, the observed metabolic alterations driven by diet may favor a decrease in the daily energy intake, and consequently decrease WC, visceral adiposity, and thus, be beneficial for an efficient management of the risk factors for cardiovascular diseases, especially in males ⁽¹⁴⁾. As shown in population studies, participants with elevated WC have increased obesity health risks ⁽³²⁾ as compared to those with a normal WC, even with a similar BMI ⁽¹⁵⁾.

In the present study, at baseline, the participants of both genders presented alterations on the biochemical markers (Glucose, TC, HDL-c, LDL-c and TG). However, males showed higher levels of glycaemia and triglycerides and lower levels of HDL-c as compared to females, which corroborates with the anthropometric markers

where males were classified as obese degree I and females as overweight. In addition, higher indexes of WC, characterizing higher abdominal adiposity, and high WHR were verified at baseline in males.

In contrast, after the weight loss, demonstrated by a decreased BMI and WC at T3, the participants of both genders showed statistically significant lower levels of glycaemia, total cholesterol, triglycerides and higher levels of HDL-c. These findings are in accordance with several studies and with the Guidelines for Managing Overweight and Obesity in Adults, 2013, which provides recommendations based on evidences and advise the overweight and obese individuals with risk factors for cardiovascular diseases (arterial hypertension, dyslipidemia and hyperglycemia) that lifestyle changes that promote a weight loss from 3% to 5% produce benefits clinically significant for health ^(15; 16; 33).

Regarding the lipid profile, a meta-analysis of 70 studies, indicated that for each kg of weight lost, a reduction of 1.9 mg/dl on TC and 0.77 mg/dl on LDL-c, is observed. The nutritional intervention implemented in these studies, displayed calorie and fat restrictions of approximately $\leq 30\%$ of the total calorie value ⁽³⁴⁾, which is similar to the results observed in the present study.

The body composition and biochemical markers changes observed in our study were quite significant ^(15; 16; 22). Studies have suggested that diets rich in vegetables, fruits, whole grains, lean meat, extra virgin olive oil and low-fat milk products are better to aid individuals to achieve their healthy weight ^(12; 35). For example, fruits and vegetables are known by its high-fiber content ⁽¹⁴⁾, and in this study all participants were prescribed of oatmeal and linseed in the daily dietary proposal.

In this context, it was verified a reduction on the energy intake and consequent on body weight with the addition of fibers on the diet. It is well established that soluble fibers increase satiety, as it increases the weight and volume of the aliments without increasing the energy intake. Therefore, more aliments may be eaten, without the proportional energy increase ⁽¹¹⁾. An important translational study performed by NHANES regarding the association between the oatmeal consumption and diet quality showed that although the energy intake of the individuals who eat oatmeal was not similar to those who do not eat oatmeal, their body weight, BMI and WC were significantly lower ⁽²⁸⁾. The association between the fiber intake and the decreased

general risk for cardiovascular diseases, and more specifically for coronary heart disease is known for decades ^(36; 37), which lead to a conclusion that this dietary habit contributed to the positive results obtained by the participants in this study.

The present study oriented a nutritional intervention similar to the MD patterns. The literature already show that the MD is a healthy dietary pattern, associated to decreased risks to develop MetS ^(3; 38), cardiovascular diseases ^(3; 27; 39), and cancer ⁽³⁾, in addition to be shown to contribute as a protector against the NCDs ⁽³⁸⁾. One of the hypothesis for this association is that the increased content of benefic compounds, such as antioxidants and polyphenols, largely present on the nutritional composition of MD; vegetables, fruits and wine, have anti-inflammatory properties ⁽³⁸⁾. In particular, the intake of monounsaturated fatty acids, represented by the extra virgin olive oil, was shown to be associated with a reduced prevalence of risk factors for chronic inflammatory diseases ⁽⁴⁰⁾.

Additionally, it is noteworthy that the participants who reported arterial hypertension at baseline, presented a reduction on the medication dosage or even prescription suspension by the responsible physician at T3. Studies demonstrate that weight loss is associated with a reduction in blood pressure, as well in the need for medication to control this disorder ⁽¹⁵⁾. The literature suggest that blood pressure reductions are consistent with weight loss, and for each 2 kg lost, positive alterations are observed on the pressure levels ⁽¹¹⁾.

Although the focus of the present nutritional intervention was not to directly control and monitor physical activity, the main findings showed an important improvement on the lifestyle, besides the nutritional and dietary education when exercises were included in the lifestyle of the participants. At T3, it was verified a better adherence to physical activities by those who were considered insufficient active at baseline. Indeed, the dietary behavior is intrinsically related to the factors that evolves physical activity ^(11; 33), which doubtlessly develop a relevant role on the participants adherence and maintenance capacity to change habits and lifestyle in a long term ^(13; 34).

A BMI and central adiposity reduction was associated with decreased prevalence of obesity, and consequently the participants experienced a reduction on the MetS individual risk factors, post-intervention by substantially decreasing the chances to develop MetS and other associated comorbidities ⁽¹²⁾. It is argued that there is no need for the patients to achieve lower BMI than 25kg/m² to have significant benefits to

health, although as high is the BMI and WC, higher is the risk of developing cardiovascular diseases ⁽³⁴⁾, type 2 diabetes, sleep apnea and many other NCDs conditions ⁽⁴⁾; but there is strong evidences in the literature that the moderate weight loss (5 to 15%) may significantly reduce the risk for these conditions, even if the patients remain in the category of obese and overweight ⁽³⁴⁾. The sustained weight loss of 3% to 5% is likely to result in clinically important reductions on the levels of TC, LDL-c, TG, glycaemia, lower risks to develop type 2 DM and better arterial pressure control.

In conclusion, the present study showed that the dietary intervention effects on weight loss and metabolic control management were highly effective on the studied population. Similar programs, easily operated and with low financial investments, can be very positives in preventing obesity and promoting health. The nutritionists should develop a relevant role, in interdisciplinary teams of primary health care, integrating preventive and curative actions on the management of patients with obesity or overweight. In the last few years, the economic costs of obesity raised considerable attention and may be measured by the financial impact of the associated diseases on the health system (direct costs) or by the loss of productivity and quality of life (indirect costs) of the individuals and for the society ⁽⁴¹⁾. Therefore, obesity represents a huge challenge to health, especially on developing countries, such as Brazil.

CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest. This review was undertaken as part of self-funded MD study.

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TABLES**Table 1:** Characteristics of the study population according to gender at baseline

Variables	Female	Male	Total	p-value
Age (years)	n(%)	n(%)	n(%)	
Until 29	45(14.0)	16(20.3)	61(15.3)	0.498
30 - 40	119(37.1)	30(38.0)	149(37.3)	
41 - 50	96(29.9)	21(26.6)	117(29.3)	
> 50	61(19.0)	12(15.2)	73(18.3)	
Schooling				
Higher	213(66.4)	50(63.3)	263(65.8)	0.859
Technical	91(28.3)	24(30.4)	115(28.8)	
Fundamental	17(5.3)	5(6.3)	22(5.5)	
Work Shift				
Day time	291(90.7)	62(78.5)	353(88.3)	0.003
Night shift	30(9.3)	17(21.5)	47(11.8)	
Marital Status				
Single	130(40.5)	30(38.0)	160(40.0)	0.682
Married	191(59.5)	49(62.0)	240(60.0)	
Physical Activity				
Active	66(20.6)	24(30.4)	90(22.5)	0.061
Insufficient active	255(79.4)	55(69.6)	310(77.5)	
Alcohol consumption				
No	192(60.0)	21(26.9)	213(53.5)	<0.0001
Yes	128(40.0)	57(73.1)	185(46.5)	
Meals (daily)				
5-6	87(27.1)	20(25.3)	107(26.8)	0.748
2-4	234(72.9)	59(74.7)	293(73.3)	
BMI (≥ 25 kg/m²)				
No	29(93)	13(16.5)	106(26.5)	0.024
Yes	228(71)	66(83.5)	294(73.5)	
BMI (≥ 30 kg/m²)				
No	220(68.5)	34(43)	254(63.5)	<0.0001
Yes	101(31.5)	45(57)	146(36.5)	

BMI: body mass index. Statistics: Normality test: Kolmogorov-Smirnov. Non-parametric test: Mann-Whitney. Significance value set as < 0.05 .

Table 2: Biochemical and body composition parameters according to gender at baseline

Variables	Female	Male	p-value
	Mean (SD)		
Glucose (mg/dl)	90.7(21.1)	108.2(60.0)	<0.0001
TC (mg/dl)	200.9(43.0)	207.3(50.4)	0.273
HDL-c (mg/dl)	49.5(10.3)	41.8(10.1)	<0.0001
LDL-c (mg/dl)	123.5(38.9)	126.4(39.5)	0.580
TG (mg/dl)	140.7(82.2)	207.1(164.8)	<0.0001
BW (kg)	71.9(13.8)	90.4(16.6)	<0.0001
BMI (kg/m ²)	28.2(5.2)	30.3(4.8)	0.001
WC (cm)	86.0(12.0)	99.7(10.9)	<0,0001
HC (cm)	105.9 (9.1)	107.2 (8.2)	0.241
WHR (cm)	0.81 (0.1)	0.93 (0.1)	<0.0001

SD: standard-deviation; TC: total cholesterol; HDL: high-density lipoprotein; LDL: low-density lipoprotein; TG: triglycerides; BW: body weight; BMI: body mass index; WC: Waist circumference; HC: Hip circumference; WHR: Waist hip ratio. Statistics: Normality test: Kolmogorov-Smirnov. Non-parametric test: Mann-Whitney. Significance value set as < 0.05.

Table 3: Anthropometric and biochemical characteristics of the volunteers at baseline and after 12 weeks of nutrition intervention (T3)

Variable	Mean (SD)			
	Gender	Baseline	T3	p-value
Glucose (mg/dl)	F	93.7(21.1)	88.5(17.0)	0.001
	M	127.4(67.2)	95.2(32.5)	0.001
TC (mg/dl)	F	226.5(45.1)	179.1(32.8)	0.022
	M	199.2(46.4)	172.4(31.4)	0.001
HDL-c (mg/dl)	F	47.8(9.6)	54.6(12.2)	0.018
	M	38.9(9.6)	47.4(9.7)	0.002
LDL-c (mg/dl)	F	146.1(45.2)	102.4(30.7)	0.008
	M	123.8(49.4)	101.3(73.1)	0.004
TG (mg/dl)	F	175.9(108.2)	118.4(53.4)	<0.0001
	M	230.9(169.9)	133.3(73.1)	0.004
BW (kg)	F	74(14.2)	70.4(13.3)	<0.0001
	M	90.7(17.0)	84.6(15.0)	<0.0001
BMI (kg/m ²)	F	29(5.4)	27.5(5.0)	<0.0001
	M	30.6(4.9)	28.6(4.6)	<0.0001
WC (cm)	F	87.1(12.3)	82.2(10.9)	<0.0001
	M	101.0(10.1)	94.6(9.5)	<0.0001
HC (cm)	F	107.1(9.2)	105.9(8.6)	<0.0001
	M	107.2(8.6)	105.9(7.9)	<0.0001
WHR (cm)	F	0.82(0.08)	0.77(0.07)	<0.0001
	M	0.94(0.07)	0.89(0.07)	<0.0001

SD: standard -deviation; F: female; M: male; TC: total cholesterol; LDL-c: low density lipoprotein; TG: triglycerides; HDL-c: high density lipoprotein; BW: body weight; BMI: body mass index; WC: waist circumference; HC: hip circumference; WHR: waist hip ratio. Statistic: Wilcoxon test. Significance value set as < 0.05.

FIGURE LEGENDS

Figure 1. Clinical identification of the risk factors of the metabolic syndrome in females (A) and males (B) at baseline and T3. Risk factors defining levels: Waist Circumference (WC) > 88 cm in female and > 102 cm in male; Triglycerides (TG) \geq 150 mg/dL; High-density lipoprotein cholesterol (HDL-c) < 40 mg/dL in male and <50 mg/dL in female; Fasting glucose (GLU) \geq 110 mg/Dl; High Blood Pressure (HBP) reported (under use of medication) \geq 130/85 mmHg, according to the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III). * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Figure 2. Description of the 12-week nutritional intervention program and measurements performed at baseline and after the intervention period (T3). The red and blue arrows indicate the biochemical and anthropometric parameters of the participants at baseline and T3, respectively.

FIGURES

Figure 1.

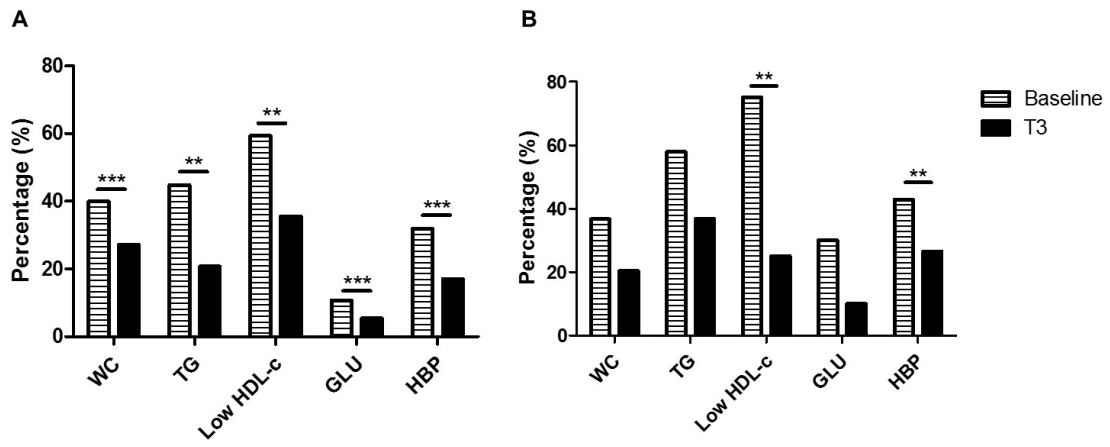
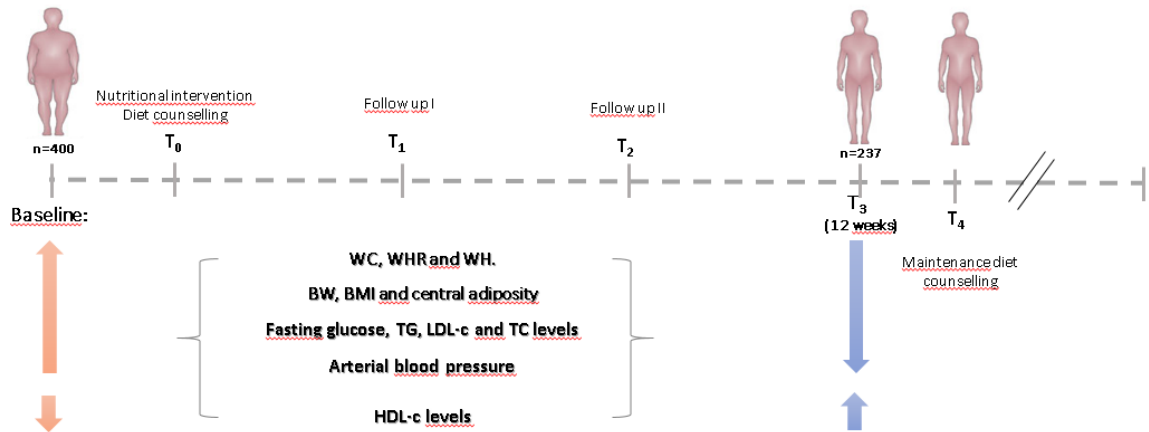


Figure 2.



3.2 Produto 2

**Nutritional status associated to skipping breakfast in Brazilian
health service patients**

Short title: Skipping breakfast and obesity in Brazilians

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ABSTRACT

Recent studies show that skipping breakfast is associated with an increased risk of obesity, diabetes, and cardiovascular diseases. In this context, this study evaluated 400 patients from the Brazilian Health Service, who had their nutritional status defined based on the BMI, and were classified as physically active or insufficient active. The energy intake and macronutrients was also assessed by a 24-h dietary recall where the association of overweight/obesity with the investigated variables were evaluated using chi-square, Student's t-test and multivariate analysis ($p < 0.05$). The main results showed that more than half of the studied population have the habit of omitting breakfast (55.8%), and among those, 81.2% were overweight/obese ($p < 0.0001$). Almost three quarters of these individuals consumed no more than four meals a day (73.0%), and regarding this meal frequency/day, 78.8% of the individuals who reported having 4 meals or less a day were overweight/obese compared with 57.8% who reported as having 5-6 meals/day ($p < 0.0001$). The individuals who reported to omit breakfast had a higher chance of being overweight compared with those who had this habit (OR= 2.20; CI:1.40-3.60) and the chance of the physically insufficient active individuals to be overweight/obese was 2.9 times higher when compared to the active individuals ($p < 0.0001$). Our findings suggest that regular breakfast consumption may decrease overweight and obesity risk.

Keywords: Skipping breakfast; Obesity; Healthy lifestyle; Physical activity.

INTRODUCTION

According to the World Health Organization (WHO), obesity has more than doubled since 1980[1]. In 2014 more than 1.9 billion adults were overweight and over 600 million were obese. This increasing prevalence of obesity may be explained by several factors, including genetic predisposition, nutrition and lifestyle [2-4]. Although the genetic factors are not the main direct cause of obesity, they increase the individual's susceptibility to develop this condition and contribute in 25% to 70% of the cases [5, 6]. The epigenetic factors also play an important role in the development of obesity, especially because the main characteristic that triggers the fat accumulation is the imbalance between energy intake and energy expenditure [7]. The energy imbalance that have been associated with the genesis of obesity may be explained by the recent changes observed in the population's dietary patterns, which includes an increasing intake of energy-dense food products, caloric beverages (such as soft drinks), and processed food products, besides the diminished frequency of physical activity observed nowadays [8, 9].

The provision of energy and nutrients throughout the day is extremely important for a good energy homeostasis. In this sense, breakfast is considered one of the three main meals to be held during the day and it is defined as the first meal you have once you wake up [10, 11]. With that in mind, it is essential to highlight the importance of the breakfast meal as an important dietary factor for energy regulation [12]. Recent studies have been showing that individuals who eat breakfast, commonly have a lower body mass index when compared to individuals who are breakfast skippers [13]. Additionally, several other studies also show that skipping breakfast is associated with overweight and obesity [13-18].

The present study aimed to address the association between omitting breakfast and the presence of overweight/obesity, by controlling demographic characteristics, habits and behaviors, and anthropometric (BMI and WC), nutritional and biochemical/clinical parameters retrieved from Brazilian health service patients.

METHODS

Study design and population

This is a cross-sectional study, where the association between the habit of having breakfast and the presence of overweight/obesity, along with other parameters, such as demographic characteristics, habits and behavior and anthropometric, nutritional and biochemical/clinical were evaluated. All data was retrieved from Brazilian health service patients.

This study was conducted in the ambulatory of the Nutrition Clinic/Tancredo Neves Ambulatory Specialties Center - CAETAN/ Universidade Estadual de Montes Claros - UNIMONTES located in Montes Claros, Minas Gerais, Brazil. The individuals included in the study were the patients attending the Lifestyle Changing Program – “Nutrition and Health”, in the period from January 2013 to December 2014. All the individuals are employees of the Universidade Estadual de Montes Claros that were interested in participating in the “Nutrition and Health program”, which is aimed to improve the quality of life of the employees, changes of habit and lifestyle, by focusing in the dietary reeducation. These patients constitute a universe of 2400 UNIMONTES employees.

The sample size was defined considering the following parameters: Percentage of 50% for overweight/obesity occurrence, level of confidence of 95% and an error rate of 5%. The calculations evidenced the need to evaluate 384 patients. For the patients selection, a nonprobability sampling was applied, being considered the spontaneous demand of the patients who requested the Clinical Nutrition Service. The inclusion criteria were: Age superior to 18 years old, the absence of pregnancy and not have been submitted to bariatric surgery.

Additionally, in this study, individuals undergoing treatment for dyslipidemia, hypertension (self-reported use of antihypertensive medication) or diabetes were automatically classified as presenting those conditions.

Subjects gave their written consent to participate in the study, which was approved by the Ethics Committee of the Universidade Estadual de Montes Claros, by the process number 152 337.

Anthropometric measurements

Body weight was measured in kilograms (kg) in an electronic scale Balmak, Model BK-50FA (minimum capacity of 1 kg and a maximum of 150 kg, sensitivity of 50g and calibrated by the Institute of Weights and Measures). In order to standardize the weighing, the participants were weighed in typical indoor clothing without shoes. The height (m) was determined to the nearest 0.1cm, with the participants standing upright against an aluminum stadiometer (Model BK-50FA), coupled to the scale (maximum capacity of 200cm, with intervals of 0.5cm, without shoes).

The overall nutritional status was defined based on the Body Mass Index (BMI), according to the World Health Organization [19]. Epidemiologic studies generally use the BMI, which is calculated with the body weight and height [weight (Kg)/Height (m²)], as an indicator of body weight excess and obesity. Furthermore, the international definitions of overweight and obesity in adults are based on the BMI as the body weight and height can be measured in a relatively simple and precise manner. However, the BMI does not predict the body composition directly and since obesity refers to an increase in the body adiposity, the underlying assumption of using the BMI to define obesity is that at a given height, an elevated weight is associated with increased fat.

However, partly because of the limitations of BMI, the use of other simple measures to assess adiposity such as waist circumference or the ratio of waist-hip, has also been suggested [20].

Having said that, in this study the individuals were classified in the following groups: Normal weight: BMI >18.5 and <25 kg/m²; overweight: BMI ≥25 and <30 kg/m² and obese as BMI ≥30 kg/m². The participants included in the groups overweight and obese were grouped in one unique group as follow: overweight/obese (BMI ≥25kg/m²) [19].

The waist circumference (WC) was obtained using an inelastic tape, with a scale of 0.5cm placed without pressure in the horizontal plane at the smallest circumference between the bottom of the last rib and the iliac crest[21-23]. The WC was classified as increased when greater than or equal to 80 cm for women and greater than or equal to 94 cm for men, and very increased when greater or equal to 88 cm for women and greater than or equal to 102 cm for men [22].

Biochemical measurements

The serum levels of fasting glucose, total cholesterol, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, and triglycerides were measured by using specific enzymatic Elisa kits (DSA BioELISA, USA) [18]. The individuals were previously advised to do not perform vigorous physical exercises 24-hours and/or consume alcohol 72-hours prior to blood collection.

The cut-offs recommended by Brazilian Guideline for Dyslipidemia and Atherosclerosis prevention were: total cholesterol ≥ 200 mg/dl (High) < 200 mg/dl (Normal); triglycerides (TG) ≥ 150 mg/dl (High) < 150 mg/dl (Normal); low-density lipoprotein (LDL-c) ≥ 160 mg/dl (High) < 100 mg/dl (Normal) and high-density lipoprotein (HDL-c) < 40 mg/dl (men) and < 50 mg/dl (women) (Lowered). The determination of dyslipidemias involves changes in isolation or together of the four measured parameters [24].

The glycemia cut-offs were considered as follows: Fasting Plasma Glucose (FPG) < 100 mg/dl (Normal) and from 100 mg/dl to 125 as identifying individuals with prediabetes and FPG ≥ 126 mg/dl as identifying individuals with diabetes (Abnormal) [25].

Nutrition assessment

The evaluation of energy intake and macronutrients (carbohydrates, proteins and lipids) was performed by a 24-h dietary recall (24HDR) (See supplemental material) [14]. This strategy allowed us to identify the times and meal consumption frequency (breakfast, morning snack, lunch, snack, dinner and optional meal), the amount consumed of each food item (in household measures)[26]and details of feeding behavior. For the ingested caloric surplus calculations, the total caloric value (TCV)/ day was assessed taking into consideration the formula of 30kcal/kg/day considering the ideal body weight [27].

Based on two 24HDR data[26], the food items consumed in each meal were identified and converted in nutrients and calories using the software “Nutrition Support Program/Version 2.5/Medical School of São Paulo”. However, due to the occurrence of numerous regional consuming products, some foods had to be added using the Brazilian Table of Food Composition [28].

Individuals were classified as breakfast skippers based on the habit of omitting the breakfast meal for at least 5days/wk [29]. Nutritional status was defined by a joint analysis of clinical diagnosis, food habits identified in the food anamnesis, and especially by anthropometry, having BMI as the main factor [30]. A dietitian single trained examiner performed the evaluation of all the parameters.

Physical activity assessment

For the physical activity evaluation, the classification described by the World Health Organization was adopted [31], using the criteria: adults aged 18-64 should do at least 150 minutes of moderate-intensity aerobic physical activity throughout the week or of at least 75 minutes of vigorous-intensity aerobic physical activity throughout the week or an equivalent combination of moderate- and vigorous-intensity activity. Thus, in our article the variable was categorized as "active" for individuals who meet this criteria and "insufficient active" for those who do not meet.

Statistical Analysis

Individuals participating in the study were described according to their demographic characteristics, food consumption habits, behavior and nutritional status. The association of overweight/obesity with the investigated variables was assessed using chi-square for the categorical variables and the Mann-Whitney test for the numeric variables that did not present normal distribution. The normality of these numeric variables was assessed by the Kolmogorov-Smirnov test.

Variables with descriptive level (p-value) no greater than 0.25 in bivariate analysis were included in the multivariate analysis, using Logistic Regression Models (LRM). The regression models considered the overweight/obese status as the dependent variable and the habit of having breakfast as the independent variable. All the other variables were treated as confounding variables. Brute and adjusted odds ratios (with their respective confidence interval of 95%) were estimated. The significance level at this stage was 0.05, and the Hosmer-Lemeshow test was used to assess the model's fit quality. All analyzes were performed using Predictive Analytics Software (PASW) version 17.0 for Windows software.

RESULTS

Sociodemographic characteristics

A total of 409 patients requested the Clinical Nutrition Service, and out of these, 9 did not attend the inclusion criteria (5 pregnant and 4 patients submitted to bariatric surgery). Therefore, 400 patients were enrolled in the study, being 73.5% of those overweight/obese. The majority of the individuals were female (80.2%). Regarding the gender, the larger number of females included in this study may be explained by the spontaneous demand of females to this kind of services, such as nutritional assistance, and by the fact that females are usually more motivated to have body and health care [32, 33]. Concerning the age, 52.6% of the individuals were aged from 18 and 40 years old, the mean age for females was 40.2 (SD=9.9) years old (min 19; max 60) and 38.4 (S.D=10.2) years old for males (min 24; max 56). However, despite the higher percentage of women on the sample, the average age of both genders showed no significant differences when evaluated by Student's t test ($p=0.148$). In his study, we adopted as the socioeconomic indicator only the level of schooling, since each level corresponds to a specific income range in the salary path of the Universidade Estadual de Montes Claros, where the individuals work. For this parameter, it was observed that 94.6% of the individuals were classified as having technical or higher schooling degree (Table 1). The distribution of the further sociodemographic characteristics is present in the Table 1.

Regarding the association between overweight/obese and the sociodemographic characteristics, higher chances of being overweight/obese were observed for female individuals, (OR = 2.30, $p=0.013$), patients over 50 years old (OR=3.0, $p=0.009$), civil state married (OR = 1.60, $p=0.050$) (Figure 2).

Habits and behavior

More than half of the studied population did not have the habit of having breakfast (55.8%) and almost three quarters consume no more than four meals a day (73.0%). Concerning the physical activity practice, 77.5% were considered insufficient active e 53.5% declared no consumption of alcohol (Table 1).

It was verified that 81.2% of the individuals who did not have the habit of having breakfast were overweight/obese. Regarding meal frequency/day, 78.8% of the individuals

who reported having 4 meals or less a day were overweight/obese as compared with 57.8% who reported as having 5-6 meals/day ($p<0.0001$). Furthermore, 78.7% of the individuals who were considered insufficient active were overweight/obese as compared to the 53.3% overweight/obese individuals who were physically active (Table 1).

In the multiple analysis, when the model was adjusted by gender, age, marital status and physical activity, association statistically significant between the habit of omitting breakfast and overweight/obesity was observed (OR= 2.20, $p=0.001$), as well as the level of physical activity that was also found to be associated with overweight/obesity (OR = 2.90, ($p<0.0001$), where the chance of the insufficient active individuals to be overweight/obese was 2.9 times higher as compared to active individuals (Figure 2).

Anthropometric and nutrition parameters

In the study cohort, 26.5% of the individuals presented normal weight 37.0% were overweight and 36.5 were obese. Regarding the analysis of WC, 36.7% were classified as having central adiposity, and 97.9% of these individuals were also classified in the overweight/obese group (Table 1). Among the 294 who were overweight/obese, 48.8% presented central adiposity and among the 106 individuals with normal weight, 2.9% also presented central adiposity. However, when the individuals with central adiposity and the individuals who did not have central adiposity were evaluated regarding overweight and obesity separately, the following frequencies were observed: 36.9% overweight individuals, 18.5% individuals with central adiposity and among the 36.8% with obesity, 79.5% presented central adiposity. Thus, when the overweight or obese individuals were evaluated separately, it was observed that not all overweight individuals present normal WC, but the majority of them ($n=120$).

The caloric excess (above 20%) of the nutritional/day requirements was observed in 68.5% of the assessed individuals. The total caloric value (TCV) average found was 2418.4kcal/day (SD 454.2). Regarding macronutrients balancing, the lipid average was 30.5% (SD 4.5) and carbohydrates 53.3% (SD 6.9) (Table 1).

In the adjusted analysis (Figure 2), higher chances of being overweight/obese were observed among the patients with central adiposity (OR 23.01($p<0.0001$), and the patients with excessive caloric intake, greater than 20% (OR=3.9 $p=0.004$). Regarding the association between the total caloric intake and the nutritional status of the individuals evaluated, a

statistically significant association was also observed ($p < 0.0001$) in the bivariate analysis (Table 1). However, in the adjusted analysis, there was not statistically significant association between this variable and the nutritional status (Figure 2).

Additionally, among the individuals that omit breakfast, 81%, 40% and 38% presented overweight/obesity, central adiposity and ratio of waist-hip respectively (Figures 1). The figure 3 also display the confidence interval for the total calorie intake mean as compared to the habit of having breakfast, where it is verified a significant difference between the means of these values.

Biochemical, nutrition and clinical analysis

Concerning the biochemical parameters in the bivariate analysis, an association between overweight/obesity and the serum levels of HDL ($p = 0.023$), triglycerides ($p < 0.0001$), glucose ($p = 0.019$) and arterial hypertension ($p < 0.0001$) were observed (Table 1). However, when the adjusted analysis were applied, an association between overweight/obesity only with the variables HDL (OR = 1.90, $p = 0.039$) and AH (OR = 7.00, $p < 0.0001$) were observed (Figure 2).

DISCUSSION

Obesity, nutrition habits and behavior

This study collaborates with the comprehension about the relation between breakfast and overweight/obesity in developing countries[34]. Breakfast is considered one of the three main meals to be held during the day[29, 35], and should represent the recommended 25% energy content of the total caloric value to be consumed in a day[29, 36, 37].

The dietary pattern modifications, including the energy restriction, it is a challenging in the prevention and treatment of obesity worldwide. Thus, the comprehension that the dietary habits are associated with a reduced intake of energy it is important to optimize the obesity management [38-40]. In this sense, the consumption of breakfast may be considered a good habit. The breakfast benefits have been studied, especially regarding its omission by some individuals [38, 41]. However, it is not clear if the regular breakfast consumption is associated to a daily lower total energy intake [16].

Previous studies reported that breakfast skippers have a higher energy intake during the day than do breakfast eaters [11, 18, 42], and this increased energy intake may be associated with the current eating behavior changes [18, 22]. Therefore, this study evidenced an association between the habit of skipping breakfast with obesity and a higher total calorie intake, which can be understood as a metabolism compensation [38, 43], as the individual eats more calories during the day to compensate the lack of breakfast [9, 44]. This process may facilitate the intake of excessive calories, which was observed in this study and corroborated by previous studies [12, 18] providing evidence that skipping breakfast is not an effective way to manage weight [45].

A study performed with diabetes type 2 adults, it was demonstrated that a recommended strategy to decrease the daily consumption of energy is to eat a higher proportion of this energy in the breakfast. It seems that the energy given in the breakfast in absolute, might be correlated with opposite results, directly reflecting in the energy intake in the following meals and consequently in the daily energy consumption [46].

In addition, it may be understood that not only the habit of having breakfast might influence the total daily calorie intake, but also the nutritional content of this meal regarding the presence of macronutrients, fibers content and total energy density.

Furthermore, as confirmed in a randomized clinical trial [12] eating breakfast reduces impulsive snacks and thus, a large reduction in calories and fats intake. An explanation could be that the increased tardy food intake causes weight gain. During the morning period, the body energy expenditure is less likely to happen, and is consequently stored when the breakfast is skipped [18]. On the other hand, controlled studies showed that although skipping a meal reduced fat oxidation, it was reported that there is a trend arguing that a 6 meals/day pattern improve appetite control when compared to a 3 meals/day pattern. Consequently, reducing eating frequency to 3 meals/day may hinder the appetite control [17].

Our study found association between skipping breakfast and high BMI measurements, corroborating with NHANES and cols. who showed that 37.2% and 25.9% of the juvenile adults (19-29 years old) and adults (30-39 years old), respectively, had the habit to omit breakfast [14]. Previous studies performed by the same author evidenced a association between lower BMI and the habit of having breakfast, especially in women [40]. Additionally, in another study in a cohort of US men, breakfast consumption was found to be inversely associated with risk of 5 kg weight gain [47].

Additionally, a cross-sectional study performed with 693 Minnesota adolescents showed an inverse relationship between BMI and consumption of breakfast[48]. Another association found in our study regards the higher values of BMI and higher values of waist circumference (central adiposity) in individuals who does not have breakfast in a daily basis. This finding, corroborates with a recent longitudinal study that followed children by over 24 years and reported an association between skipping breakfast and several parameters, such as waist circumference, blood markers of insulin and low-density lipoprotein-cholesterol and higher levels of BMI [42].

Breakfast: biochemical and clinical parameters

Concerning the habit of having a regular breakfast our findings showed a significant correlation between the basal glucose levels and the prevalence of overweight/obesity, corroborating with other studies that shows that breakfast consumption can improve postprandial glycemic response and insulin sensitivity [12, 42], decrease the appetite and contribute to weight control. As obesity is considered a risk factor for several chronic diseases, such as cardiovascular diseases [14] and *diabetes mellitus*, the correlation between skipping breakfast and the development of insulin resistance deserves more attention in molecular studies [29, 41].

Skipping meals is an important cause of a decrease in the overall consumption of calories, which results in blood glucose level spikes. The omission of breakfast can cause a decrease in serum blood glucose concentrations, resulting in the activation of the gluconeogenic pathway, thus causing the disarrangement of the muscle tissue with the goal of providing glucose for the brain [14, 18]. This may lead to a decrease in physical strength, which may cause a decrease in the basal metabolism, explained by the loss of muscle volume. Moreover, the starvation state may cause the conservation of energy by limiting physical activities, which can result in a condition where the body does not lose weight but instead gains weight easily [18].

The present study identified a higher chance of the obese breakfast skippers achieve clinical conditions such as arterial hypertension and low levels of HDL cholesterol as well the excess calorie intake habit. A study by Rimmert *al.* showed that men who skipped breakfast had a 27% higher chance of developing coronary heart disease as compared with men who did not [44]. Furthermore, in another study, it was shown that the presence of breakfast was

associated with an improvement of the cardiometabolic risk in young individuals, suggesting a protective role for breakfast [14]. A study performed by Timlin and Pereira, also demonstrate that the frequency of breakfast consumption is strongly and inversely associated with the risk to develop obesity in a long term. Thus, breakfast consumption might be a mechanism to reduce the risks to develop metabolic syndrome, diabetes type 2 and hypertension. In this sense, suggesting other impacts for the breakfast consumption, not only in the adiposity, but probably in the glycemic, insulin and lipid metabolism control [11].

Obesity, breakfast consumption and physical activity

Concerning physical activity, this study found a significant association between the practice of physical activity and overweight/obesity. Regular breakfast skipping has been generally reported to be associated with a sedentary lifestyle and unhealthy diet consuming [42, 49]. Furthermore, skipping breakfast can cause not only a decrease in physical activities in the morning but also a decrease in the total energy expenditure that can result in the development of obesity [18].

The main contribution of this study is to emphasize the importance of the daily consumption of breakfast that plays important roles in obesity associated factors, such as appetite, hormonal, glycemic, insulin and lipid metabolism control. Indeed, the regular habit to consume breakfast, as well as its nutritional content will result in significant independent effects on total energy intake, dietary content, metabolic control and consequently balance the weight control. These aspects, along with a lifestyle change, will contribute preventively for the prevalence reduction of obesity worldwide.

In conclusion, our results suggest that the regular consumption of breakfast might reduce the risks of overweight/obesity development, especially when associated to the practice of physical activity. However, further studies are necessary to elucidate the direct association between obesity and the regular consumption of breakfast.

CONFLICT OF INTERESTS

The authors declare that they have no conflicts of interest. This review was undertaken as part of self-funded MD study.

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Table

Table 1. Distribution, proportion and ratio of brute chances of overweight/obesity by the variables investigated

Variables	Total, %	Overweight/ obesity, %	Normal weight, %	OR _b (95% CI)	p value*
<i>Demographic characteristics</i>					
Sex					0.020
Male	79 (19.8)	70.4	29.6	1.00	
Female	321 (80.2)	83.5	16.5	2.13 (1.12–4.05)	
Age, years					0.026
Until 29	61 (15.3)	59.0	41.0	1.00	
30–40	149 (37.3)	73.8	26.2	1.96 (1.05–3.67)	
41–50	117 (29.2)	73.5	26.5	1.93 (1.00–3.71)	
51–60	73 (18.2)	82.2	17.8	3.21 (1.46–7.04)	
Shooling					0.309
Fundamental	22 (5.4)	71.5	28.5	1.00	
Technical	115 (28.8)	73.9	26.1	1.13 (0.69–1.85)	
Higher	263 (65.8)	86.4	13.6	2.53 (0.73–8.79)	
Marital status					0.007
Single	240 (60.0)	65.6	34.4	1.00	
Married	160 (40.0)	77.9	22.1	1.85 (1.18–2.89)	
Work shift					0.974
Daytime	353 (88.3)	73.1	26.9	1.00	
Night shift	30 (7.5)	73.3	26.7	1.01 (0.44–2.35)	
Daytime/night shift	17 (4.2)	70.6	29.4	0.88 (0.30–2.58)	
<i>Habits and behavior</i>					
Breakfast					<0.0001
Eating	177 (44.3)	62.7	37.3	1.00	
Omitting	223 (55.8)	81.2	18.8	2.56 (1.63–4.03)	
Meals (daily)					<0.0001
5–6	108 (27.0)	57.8	42.2	1.00	
2–4	292 (73.0)	78.8	21.2	2.75 (1.71–4.20)	
Physical activity					<0.0001
Active	90 (22.5)	53.3	46.7	1.00	
Insufficient active	310 (77.5)	78.7	21.3	3.24 (1.97–5.31)	
Alcohol consumption					0.964
No	213 (53.5)	72.8	27.2	1.00	
Yes	185 (46.5)	73.0	17.0	1.01 (0.65–1.57)	
<i>Anthropometric parameters</i>					
BMI, kg/m ²					
Normal weight	106 (26.5)	–	–	–	
Overweight	148 (37.0)	–	–	–	
Obesity	146 (36.5)	–	–	–	
WC*					<0.0001
Normal	252 (63.3)	59.5	40.5	1.00	
Central adiposity	146 (36.7)	97.9	2.1	32.4 (10.1–104.5)	
Waist–hip ratio					<0.0001
Normal	225 (65.2)	64.7	35.3	1.00	
Increased	136 (34.8)	90.4	9.6	5.16 (2.76–9.66)	
<i>Nutritional parameters</i>					
Excess caloric, %					<0.0001
Up to 10	74 (18.5)	48.6	51.4	1.00	
10–20	52 (13.0)	63.5	36.5	1.83 (0.89–3.79)	
Above 20	274 (68.5)	81.4	18.6	4.61 (2.67–7.98)	
TCV, mean ± SD	2,418.9±454.2	2,532.6±441.7	2,103.4±320.5	1.03 (1.02–1.04)	<0.0001
Lipids, %, mean ± SD	30.5±4.5	30.4±4.8	31.0±3.4	0.96 (0.91–1.02)	0.962
Carbohydrates, %, mean ± SD	53.3±6.9	53.5±7.4	52.5±5.2	1.03 (0.99–1.06)	0.180

Variables	Total, %	Overweight/ obesity, %	Normal weight, %	OR _b (95% CI)	p value*
<i>Biochemical and clinical parameters</i>					
HDL*					0.023
Normal	165 (45.8)	67.3	32.7	1.00	
Lowered	195 (54.2)	77.9	22.1	1.72 (1.08–2.75)	
LDL*					0.747
Normal	204 (57.8)	74.0	26.0	1.00	
High	149 (42.2)	72.5	27.5	0.93 (0.57–1.49)	
Total cholesterol					0.452
Normal	193 (52.9)	71.5	28.5	1.00	
High	172 (47.1)	75.0	25.0	1.20 (0.75–1.91)	
TG					<0.0001
Normal	225 (63.0)	65.8	34.2	1.00	
High	132 (37.0)	85.6	14.4	3.09 (1.77–5.41)	
Fasting glycemia					0.019
Normal	289 (79.2)	70.9	29.1	1.00	
Abnormal	76 (20.8)	84.2	15.8	2.19 (1.12–4.26)	
AH					<0.0001
No	268 (67.2)	64.2	35.8	1.00	
Yes	131 (32.8)	90.8	9.2	5.54 (2.91–10.54)	

BMI = Body mass index; WC = waist circumference; TCV = total caloric value; HDL = high-density lipoprotein; LDL = low-density lipoprotein; TG = triglycerides; AH = arterial hypertension; CI = confidence interval; SD = standard-deviation. Interval of 95% confidence. * p < 0.05; the totals were due to the lack of information.

FIGURE LEGENDS

Figure 1 – Analysis of the association between the habit of having or omitting breakfast and the Body Mass Index, Waist circumference and Waist-hip ratio. A) 81% of the individuals with overweight/obesity were breakfast skippers ($p<0.0001$); B) 40% of the individuals that presented abdominal obesity did not have the habit of having breakfast; C) 38% of the individuals with altered waist-hip ration were also breakfast skippers.

Figure 2 - Association (OR) between the regular breakfast and overweight/obesity adjusted for demographic characteristics, habits and behavior, anthropometric, nutritional, biochemical and clinical parameters: Omitting breakfast (OR=2.20, $p=0.001$), female gender (OR=2.30, $p=0.013$), age above 50 years old (OR=3.0, $p=0.009$), marital status – married (OR=1.60, $p=0.050$), insufficient active (OR=2.90, $p<0.0001$), caloric excess above than 20% (OR=3.90, $p=0.004$), low HDL levels (OR=1.90, $p=0.039$), arterial hypertension (OR=7.0, $p<0.0001$) and waist circumference (central adiposity) (OR=23.01, $p<0.0001$) are factors associated with obesity. OR: Odds Ratio.

Figure 3 – Analysis of the association between the habit of having or omitting breakfast and the total caloric value. The group of individuals who had the habit of having breakfast presented a decreased total caloric value compared to the individuals who omit breakfast ($p=0.003$). Interval of 95% confidence.

FIGURES

Figure 1.

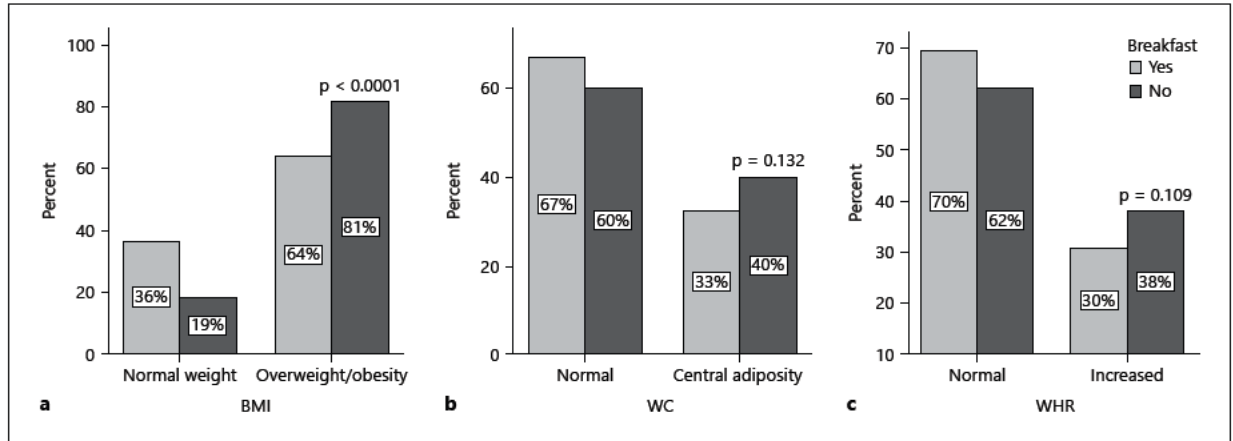


Figure 2.

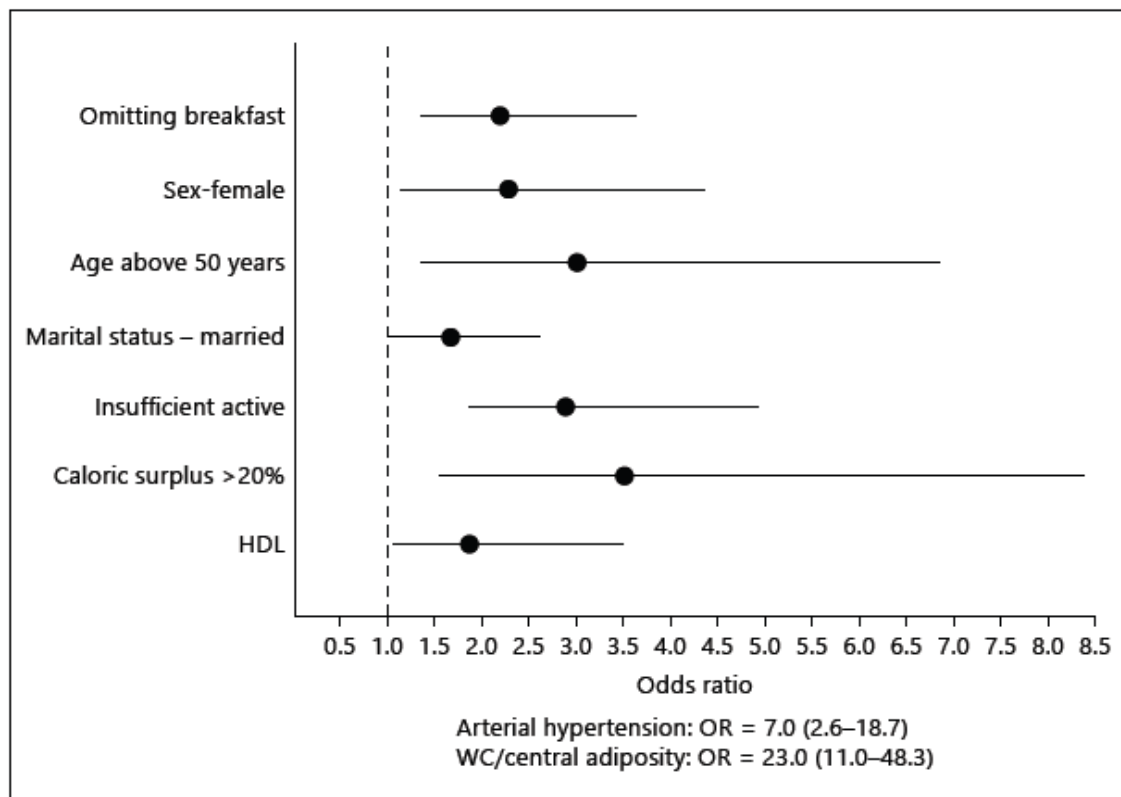
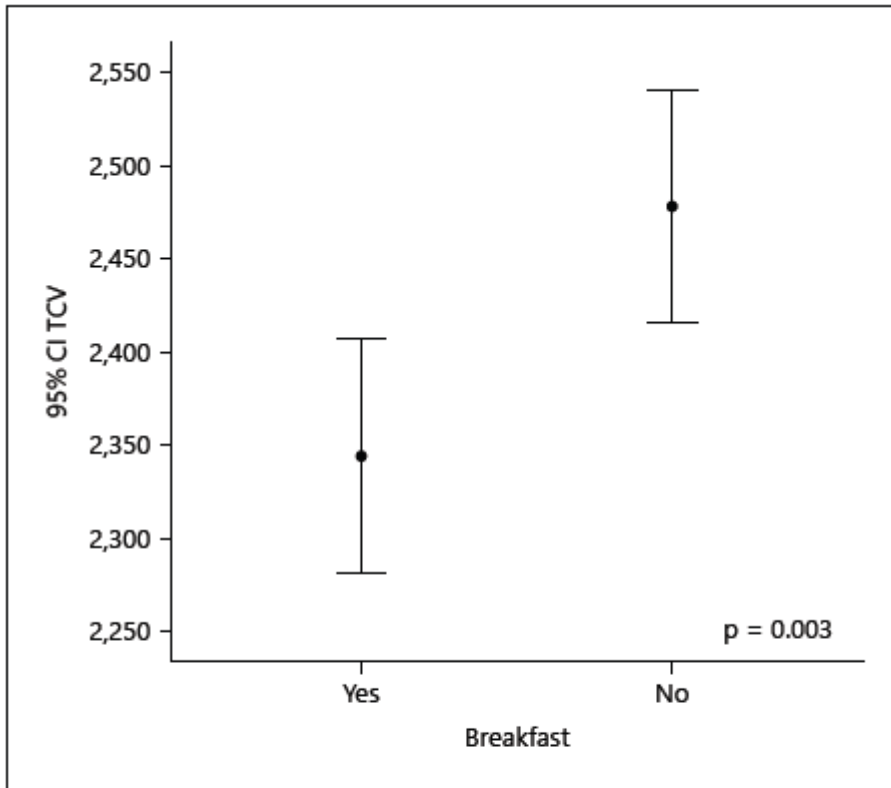


Figure 3.



4 CONSIDERAÇÕES FINAIS E CONCLUSÕES

A obesidade é caracterizada pelo acúmulo excessivo de gordura corporal com potencial prejuízo para a saúde (1). A prevalência de sobrepeso e obesidade está aumentando de forma alarmante em todo o mundo (2). Estudos epidemiológicos indicam que a alta prevalência de sobrepeso e obesidade, concomitantes com os fatores de risco para a saúde, seja um desafio relevante de saúde pública mundial (3).

O Programa Nutrição e Saúde, focado na intervenção nutricional e adotado neste estudo, é um exemplo de estratégia de educação em saúde que tem como objetivo proporcionar aos participantes informações e habilidades práticas para ajudá-los a repensar o ambiente alimentar, alcançar as recomendações dietéticas ideais e mudança no estilo de vida. Os participantes foram incentivados a optarem por melhores escolhas alimentares e práticas dietéticas saudáveis com foco na saúde global e não apenas na perda ponderal. Também foram encorajados a adotar mudanças nos comportamentos alimentares que fossem duradouras e que pudessem ser incorporadas aos seus estilos de vida, antecipando que a nova tomada de decisão facilitaria a continuidade de escolhas saudáveis e a manutenção do peso sustentado a longo prazo, pautando-se sempre na proposta de educação alimentar e nutricional e nos princípios de promoção da saúde.

No geral, o programa de intervenção nutricional de 12 semanas mostrou-se bastante efetivo tanto pelos resultados de composição corporal e metabólicos, como também verificados através da anamnese nutricional e RD24h realizados no final da intervenção. Verificou-se notável redução no consumo de calorias totais, melhor adequação da composição dietética em relação aos macro e micronutrientes, melhor incremento de fibra total da dieta (fibras provenientes de frutas, vegetais, aveia e linhaça), menor consumo de carnes vermelhas e maior consumo de peixes, frango e ovos, maior consumo de gorduras monoinsaturadas (azeite extra virgem) e notável redução no consumo de alimentos processados. Também foi possível observar alterações nos comportamentos alimentares e hábitos de vida. Por exemplo, melhor fracionamento de refeições/dia (5-6 refeições/dia), inclusão do desjejum, refeição café da manhã como rotina diária, maior consumo de água ingerida ao longo do dia (>2l/dia) e verificação de adesão à prática de atividade física para aqueles considerados “inativos” no início da intervenção.

Ressalta-se que a saúde de um indivíduo pode ser determinada pela própria biologia humana, pelo ambiente físico, social e econômico a que está exposto e pelo seu estilo de vida, isto é, pelos hábitos de alimentação e outros comportamentos que podem ser benéficos ou prejudiciais. Em uma observação plena, muitos foram os relatos desses indivíduos referindo-se à melhora da autoestima, satisfação pessoal, bom humor, menor ansiedade, melhor desempenho no trabalho, nos estudos, melhor qualidade de sono e relacionamento com o parceiro e outros benefícios, comprovando de forma tangível a melhor qualidade de vida experimentada por aqueles que perdem peso ao adotarem mudanças reais no estilo de vida e, conseqüentemente, gozando de melhor saúde física, psíquica e social.

Concluimos que os resultados verificados na intervenção nutricional mostraram-se bastante efetivos na alteração da composição corporal e controle metabólico em adultos com sobrepeso e obesidade. A intervenção nutricional individual melhorou o perfil de saúde dos indivíduos com DCNT, bem como controlou os fatores de risco relacionados à gênese da SM e outras DCNT. Os resultados também sugerem que o consumo regular do desjejum, refeição café da manhã, pode diminuir o risco de sobrepeso e obesidade. Programas como este, relativamente de fácil operacionalização e baixo investimento financeiro, podem ser muito eficazes na prevenção da obesidade e promoção da saúde. Os nutricionistas devem desempenhar papel relevante, em equipes interdisciplinares de cuidados primários de saúde, integrando ações preventivas e curativas na avaliação e gestão de pacientes com sobrepeso e obesidade.

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APÊNDICES

APÊNDICE A – Termo de Consentimento Livre e Esclarecido



UNIVERSIDADE ESTADUAL DE MONTES CLAROS
HOSPITAL UNIVERSITÁRIO CLEMENTE DE FARIA



**TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO PARA PARTICIPAÇÃO
EM PESQUISA**

Título: Eficácia da intervenção nutricional educativa nos funcionários atendidos no ambulatório de nutrição clínica no Centro de Especialidades Tancredo Neves – CAETAN/Programa Mudança de Hábito & Estilo de Vida/ Nutrição e Saúde da Universidade Estadual de Montes Claros - UNIMONTES

Instituição promotora: Universidade Estadual de Montes Claros – UNIMONTES

Pesquisador: Gislaine Cândida Batista Jorge

Orientador: Prof. Dr. Sérgio Henrique Sousa Santos

Atenção: Você está sendo convidado (a) para participar, como voluntário, de uma pesquisa. Antes de aceitar participar, é importante que você leia e compreenda a explicação sobre os procedimentos. Após ser esclarecido (a) sobre as informações a seguir, no caso de aceitar fazer parte do estudo, assine ao final deste documento, que está em duas vias. Uma delas é sua e a outra é o pesquisador responsável.

1 - Objetivo: Avaliar a eficácia da intervenção nutricional educativa através da perda de peso, melhora nos índices bioquímicos e controle de dislipidemias, diabetes, hipertensão arterial e mudança no estilo de vida.

2 – Metodologia/Procedimentos: Serão realizadas entrevistas e exames bioquímicos. Os exames de sangue serão coletados de acordo com técnicas adequadas de laboratório. Serão realizadas avaliações de medidas antropométricas (peso, altura e circunferência abdominal), avaliação nutricional, recordatório 24horas da ingestão alimentar, cálculo de IMC e cálculo de valor calórico total para a prescrição de plano nutricional individualizado. Estas análises permitirão identificar algumas condições de saúde dos participantes, sendo que nenhum trará prejuízos a saúde dos participantes.

3 - Justificativa:

O crescente aumento das doenças crônicas em níveis epidêmicos está relacionado às mudanças ocorridas na dieta e no estilo de vida. É sabido que dieta e atividade física são fatores importantes na promoção e na manutenção da saúde durante o ciclo da vida, e que características da dieta podem determinar não somente a saúde do indivíduo no momento atual, mas também desencadear o desenvolvimento das doenças crônicas não transmissíveis (DCNT), como o câncer, as doenças cardiovasculares e o diabetes. Entre os fatores de risco que contribuem para o aparecimento das DCNT, destacam-se: tabagismo, etilismo, obesidade, sedentarismo e baixo consumo de frutas e hortaliças. Embora passíveis de prevenção, os dados epidemiológicos apontam para um importante potencial de crescimento de um estilo de vida inadequado em sociedades menos e mais

desenvolvidas, o que tem demandado, de autoridades e de profissionais de saúde, uma série de medidas, principalmente educativas, para tentar controlar o problema. Portanto é necessário que possamos propor modelos de intervenção nutricional visando a prevenção primária e a detecção precoce de DCNT para este grupo da população.

Este estudo se baseia na interrelação dos hábitos nutricionais, estilo de vida e doenças crônicas não transmissíveis.

4 - Benefícios: Você estará contribuindo para a compreensão do fenômeno estudado e para a produção de conhecimento científico.

5- Desconfortos e riscos: não há.

6- Danos: não há.

7 - Confidencialidade das informações: Será mantido o sigilo quanto à identificação dos participantes. As informações/opiniões emitidas serão tratadas anonimamente no conjunto dos entrevistados e serão utilizadas apenas para fins de pesquisa.

8 - Compensação: A participação é voluntária, portanto, não é passível de remuneração.

9 - Informações adicionais: Será garantida ao participante a liberdade de recusar ou retirar o consentimento sem penalização em qualquer etapa da pesquisa.

10 - Consentimento: Li e entendi as informações precedentes. Tive oportunidade de fazer perguntas e todas as minhas dúvidas foram respondidas a contento. Este formulário está sendo assinado voluntariamente por mim, indicando meu consentimento para participar nesta pesquisa, até que eu decida o contrário. Receberei uma cópia assinada pelo pesquisador deste consentimento.

_____	_____	_____
Nome do participante	Assinatura do participante	Data
Gislaine Cândida Batista Jorge	_____	_____
Nome da pesquisadora responsável	Assinatura do responsável	Data

APÊNDICE B – Protocolo de avaliação nutricional



UNIVERSIDADE ESTADUAL DE MONTES CLAROS
HOSPITAL UNIVERSITÁRIO CLEMENTE DE FARIA



PROGRAMA NUTRIÇÃO E SAÚDE
AMBULATÓRIO DE NUTRIÇÃO CLÍNICA
ANAMNESE NUTRICIONAL

Registro:

MASP:

Data da 1ª consulta: ___/___/___

Telefone:

Nome: _____ Sexo: () F () M

Data de nascimento: _____ Idade: __anos Estado civil:

Procedência:

Profissão: _____ Escolaridade:

Turno de trabalho: ()Diurno ()Noturno

Ocupação funcional:

ENCAMINHADO POR:

DIAGNÓSTICO:

ATIVIDADE FÍSICA: ()sim ()não () <150min/sem () >150min/sem

Tipo de exercícios: () Aeróbico () Resistência muscular

HISTÓRIA FAMILIAR:

HAS:

DIABETES:

DISLIPIDEMIAS:

OUTROS:

HISTÓRIA CLÍNICA:

Diabetes () DM tipo 1 () DM tipo 2 () Não diabético

Menopausa () sim () Não Tratamento hormonal () Sim () Não

Há quanto tempo?

HAS: () sim () não () uso de medicação HAS? Doenças coronarianas:

Internações: () sim () não N^o de vezes: _____ Motivo:

Cirurgias:

Motivo:

Insuficiência Renal () Sim () Não

Outras:

Ganho ponderal recente? Sim () Não () ou Perda? Sim () Não () Quantos? kg

Peso usual: kg

Em quanto tempo?

Motivo:

EXAME FÍSICO:

Boca (prótese, lesões):

Esôfago: Disfagia () Odinofagia () Regurgitação () Pirose ()

Obs:

Estômago: Azia () Plenitude pós-prandial () Outros () _____

Intestino (N^o frequência de evacuações):

Vício (s):

Bebida alcoólica: () Cerveja () Água ardente Outra:

MEDICAMENTOS EM USO:

ANTROPOMETRIA:

Data da 1^a avaliação:

Peso Atual:	kg	% de PP:	Kg	Circunferência cintura	cm
Altura:	m	Altura estimada	m	Circunferência quadril	cm
Peso Usual:	Kg	IMC:	kg/m ²	Relação Cintura -quadril	cm
Peso Ideal:	Kg	CB:	cm		

Retornos/Data:

Controle Nutricional:

EXAMES COMPLEMENTARES:

Data:

<i>Exames</i>					
Glicemia Jejum		HM		Uréia	
Hb glicada A1C		HB		Creatinina	
Glic. pós-prandial		HT		B12	
Colesterol total		VCM		Albumina	
LDL		Leucócitos		K	
HDL		Neutrófilos		P	
REL. LDL/HDL		Linfócitos		CA	
TG		Acido úrico		Mg	
VLDL		TSH		FE	
		T4		Vit D	
TGO		TGP		GGT	

DIAGNÓSTICO NUTRICIONAL: _____

NECESSIDADES NUTRICIONAIS:

TMB:

NE:

Baseado em:

CDN:

VCT: kcal/DIA

% de adequação CHO:

PTN:

LIP:

QUANTIFICAÇÃO SIMPLIFICADA EM PORÇÕES

Refeições	Cereais	Hortaliças		Frutas	Leite e derivados	Carne	Leguminosas	Doces açúcares	óleos
		A/B	C						
Desjejum									
Colação									
Almoço									
Lanche									
Jantar									
Ceia									
Total									
Porções recomendadas	6	3	3	3	4	2	1	1	1

Horário de trabalho:

Horário da AF:

Observações:

Gislaine C. Batista Jorge
NUTRICIONISTA CLÍNICA

Fonte: Adaptado de Krause's food, nutrition & diet therapy, 11th ed/L.Katheleen Mahan and Sylvia Escott-Stump.

APÊNDICE C – Formulário Recordatório Dietético 24h

	AMBULATÓRIO DE NUTRIÇÃO CLÍNICA FORMULÁRIO DE QUANTIFICAÇÃO DIETÉTICA 24 HORAS (RD24h)		 Unimontes
Nome: _____ Data: ___/___/___			
Diagnóstico: _____			
REFEIÇÃO/ HORÁRIO	PREPARAÇÃO	QUANTIDADE EM (MEDIDA CASEIRA)	OBSERVAÇÕES
DESJEJUM			
COLAÇÃO			
ALMOÇO			
LANCHE			
JANTAR			
CEIA			
VCT: _____ Kcal/dia PTN: _____ (g)% _____ LIP (g): _____% _____ CHO (g): _____% _____ % VCT proposto: _____ Observações: _____			

Nutricionista Responsável: Gislaine Cândida Batista Jorge

Fonte: Adaptado de Krause's food, nutrition & diet therapy, 11th ed/L. Kathleen Mahan and Sylvia Escott-Stump; p404-405.

APÊNDICE D – Lista de substituição de alimentos



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**LISTA DE SUBSTITUIÇÃO DE ALIMENTOS****ARROZ COZIDO – 38 Kcal**

Arroz cozido – 1 colher de sopa cheia
 Farofa de carne desfiada – 1 colher de sopa rasa
 Farofa de ovos – 1 colher de sopa rasa
 Farofa simples – 1 colher de sopa rasa
 Farofa de legumes – 1 colher de sopa rasa
 Pirão – 2 colheres de sopa rasa
 Farinha de mandioca – 1 colher de sopa rasa
 Farinha de milho – 1 colher de sopa rasa
 Batata inglesa cozida – 1 colher de sopa cheia
 Batata inglesa frita – 1/2 concha pequena
 Inhame – 1 colher de sopa cheia
 Batata baroa – 1 colher de sopa cheia
 Empada de frango – 1 unidade pequena
 Empada de camarão – 1 unidade média
 Empada de palmito – 1 unidade pequena
 Macarronada – 1 colher de sopa rasa
 Mandioca cozida – 1 pedaço pequeno
 Feijão cozido, grão e caldo – 3 colheres de sopa rasas
 Feijão cozido batido – 4 colheres de sopa cheias

VEGETAL A – 1 PORÇÃO – 24Kcal (Livre)

Abóbora verde, acelga, agrião, alface, almeirão, beralha, chicória, couve, couve-flor, escarola, espinafre, mostarda, repolho, serralha, brócolis, beringela, pepino, tomate, pimentão, rabanete, palmito.

VEGETAL B – 1PORÇÃO – 44 Kcal

Abóbora moranga - 4 colheres de sopa cheias ou 1 pires de chá
 Beterraba crua – 9 colheres de sopa cheias (em cubos)
 Beterraba cozida - 4 colheres de sopa cheias
 Cenoura crua – 2 unidades pequenas
 Cenoura cozida – 7 colheres de sopa cheias
 Chuchu – 1/2 unidade média ou 1 xícara de chá
 Nabo cru – 3,5 um. Médias ou 1 xícara de chá
 Vagem crua – 6 colheres de sopa
 Quiabo crua picado – 1 pires dos de café

VEGETAL C- 1 PORÇÃO – 98 Kcal (semelhante ao grupo do arroz)

Aipim cozido - 3 pedaços pequenos ou 2 colheres de sopa cheias
 Batata baroa – 2 1/2 colheres de sopa cheias
 Batata inglesa cozida – 3 colheres de sopa cheias
 Batata inglesa frita – 1 concha pequena cheia ou 3 colheres de sopa ou 1 pires de café
 Inhame – 3 colheres de sopa cheias

Hambúrguer – 1 ½ unidade (evitar)
Merluza cozido – ½ pedaço grande
Salmão – 1 pedaço médio
Ovo de galinha, inteiro cozido – 2 unidades
 Presunto cozido – 2 fatias pequenas (evitar)
 Presunto magro defumado – 4 fatias pequenas
Peito de frango – ½ unidade
 Salsicha tipo Viena enlatada – 3 unidades (evitar)
 Sardinha em conserva no óleo ou azeite - ½ latinha (desprezar óleo)

LEITE E DERIVADOS – 1 PORÇÃO – 88,5Kcal

Leite tipo C – 1 copo americano
 Leite de vaca in natura – 1 copo americano
Leite de vaca desnatado – 1 copo tipo requeijão
 Leite de vaca integral pasteurizado – 1 copo americano
 Leite em pó Ninho – 2 ½ colheres de sopa rasas
Leite em pó Mólico – 03 colheres de sopa
 Queijo prato – 2 ½ fatias tipo lâmina
 Queijo mussarela – 3 fatias tipo lâmina
Queijo minas frescal – 1 fatia média
 Requeijão comum cremoso – 1 colher de sobremesa
Ricota – 1 fatia média
Cottage – 1 colher de sobremesa
Iogurte natural desnatado – 1 potinho médio
 Iogurte natural – 1/2 potinho médio

MARGARINA – 1 PORÇÃO – 72Kcal (EVITE)

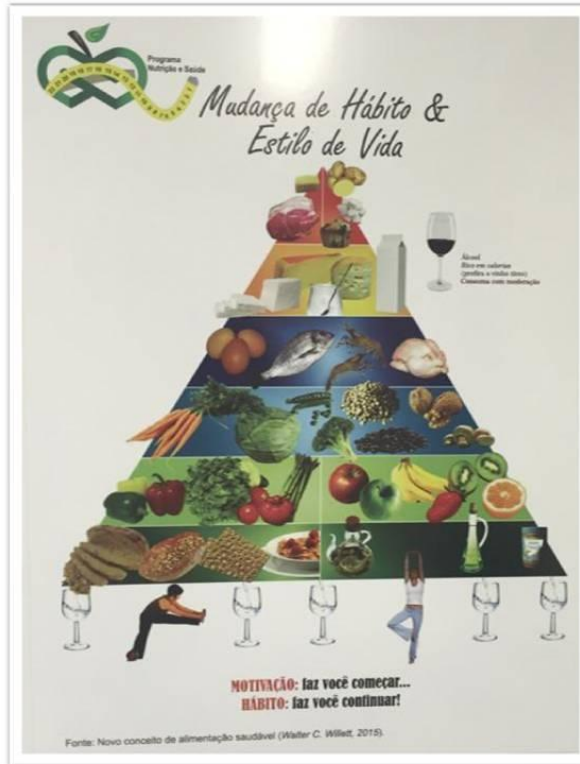
Margarina – 2 colh. De chá ou 2 pontas de faca
 Manteiga – 2 colh. De chá rasas ou 2 pontas de faca
 Creme vegetal – 3 pontas de faca
 Maionese – 2 colheres de chá
 Creme de leite – 2 colheres de sobremesa
 Azeitona – 10 unidades médias

PÃES, MASSAS E FARINHAS – 1 PORÇÃO – 142Kcal

Pão francês – 1 unidade
 Biscoitos doces:
 Casadinho – 7unid., Champagne – 1 ½ unid., Maria – 7 unid.,
 Leite (São Luiz) – 6 ½ unid.
 Biscoitos salgados:
 Cream Cracker – 5 unid., salpet – 12 unid., polvilho – 6 unid.,
 Água e sal – 5 unid.
 Água e sal Integral – 5 unid
 Pão de batata inglesa – 1 ½ unid. Médias
 Pão doce – 1 unid. Pequena
 Bolo de milho e bolo de trigo – 1 pedaço médio
 Pão de centeio – 1 pedaço médio
 Farinha de tapioca – 2 colheres de sopa
Pão de forma Integral – 2 fatias
Aveia – 3 colheres de sopa
 Granola – 2 colheres de sopa
Linhaça dourada – 2 colheres de sopa

APÊNDICE E – Pirâmide alimentar e medidas caseiras

Pirâmide alimentar



Porções, medidas caseiras e plano alimentar



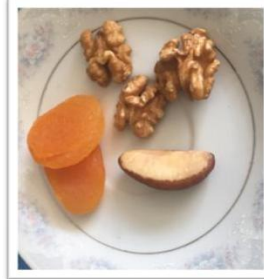
Fonte: fotos da autora.

APÊNDICE F – Recursos visuais de porções de alimentos

Sugestão de colação



Oleaginosas/colação



Sobremesa almoço



Exemplos de porções de café da manhã/lanche da tarde



Exemplos de porções de salada para entrada de almoço ou jantar



Exemplos de porções de almoço



Fonte: fotos da autora.

Exemplos de porções jantar



Fonte: fotos da autora.



Orientações Nutricionais para Obesidade

- ✓ Mastigue bem os alimentos, comendo devagar para facilitar a digestão;
- ✓ não coma nos intervalos ou enquanto prepara as refeições;
- ✓ faça de 5 a 6 refeições diárias. Não fique muito tempo sem se alimentar. Não pule ou acrescente nenhuma refeição;
- ✓ evite ingerir líquidos em excesso (no máximo 100ml) durante as refeições principais (almoço e jantar). Aumente a ingestão de líquidos entre as refeições, em média 2 litros/dia.
- ✓ não substitua uma refeição por lanches rápidos;
- ✓ mantenha alimentação saudável durante os fins de semana, evite jejuns forçados e dietas “milagrosas”;
- ✓ evite ingerir macarronada com molho, pizza e lasanha;
- ✓ procure fazer uso de leite desnatado; e cereais integrais;
- ✓ evite refeições líquidas tais como sopas e caldos, pois estas têm menor poder de saciedade;
- ✓ evite o uso de gordura de porco, peles, bacon ou torresmo. Prefira óleo vegetal (soja, milho, girassol, arroz, algodão) em pequenas quantidades;
- ✓ procure não temperar saladas com óleos ou maionese. Use apenas vinagre ou limão;
- ✓ azeite extra virgem acidez menor que 0,5, na quantidade prescrita no seu plano;
- ✓ coma primeiro a salada e depois os outros alimentos;
- ✓ procure comer carnes magras, frango sem pele, peixe sem couro, retirando toda a gordura que enxergar;
- ✓ o açúcar ou os alimentos que contém açúcar (mel, balas, bolos, bombons, pudins, chocolate e similares) devem ser diminuídos de sua alimentação. Procure ter atenção quando for utilizar um alimento dietético observando suas características. O alimento DIET não contém açúcar porém, contém calorias. O alimento LIGHT é um alimento com menor quantidade de calorias porém contém açúcar. Lembre-se que não há necessidade de utilizar qualquer alimento dietético, basta uma alimentação equilibrada e saudável;
- ✓ evite a ingestão de bebidas alcoólicas, pois estas contém calorias, porém vazias;
- ✓ evite o excesso de sal na sua alimentação. Cuidado com temperos e molhos industrializados (catchup, mostarda, maionese, caldo de carnes), pois você pode estar ingerindo grande quantidade de sal sem perceber;
- ✓ faça atividade física regular, caminhe 3 vezes por semana no mínimo 30 minutos, ou qualquer outra atividade física que você preferir ou puder conforme a liberação do seu médico e orientação de um educador físico;
- ✓ não coma quando estiver cansado, angustiado, ansioso ou inseguro. Isso pode levar a maior consumo de alimentos.
- ✓ antes de ir ao supermercado faça uma lista dos gêneros alimentícios saudáveis a serem levados para casa; lembre-se: nunca faça feira com fome!!

APÊNDICE H – Orientação nutricional para tratamento de hipertrigliceridemia



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**Orientações nutricionais na redução dos triglicérides (e peso corporal)**

Níveis elevados de triglicérides podem acompanhar níveis altos de colesterol LDL. Níveis extremamente altos de triglicérides podem aumentar o risco de doenças cardíacas. Você poderá diminuir seus triglicérides naturalmente, mas níveis notavelmente altos devem ser reduzidos o mais rápido possível. Muitas das mudanças de dieta e de estilo de vida implementadas podem não ser suficientes para diminuir os triglicérides – porém, você notará mudanças drásticas após algumas semanas quando combinar esses fatores. Em casos extremos, você também pode precisar de medicações para agilizar o processo, o seu médico saberá o momento. Seguem aqui algumas orientações para que você diminua seus triglicérides.

1- Corte ou minimize doces de sua dieta. Açúcares refinados causarão um aumento grave nos triglicérides, portanto um dos jeitos mais rápidos de diminuir o problema é cortar a ingestão de açúcar.

- Limite seus açúcares adicionais para que eles componham menos do que 5-10% de suas calorias. Para mulheres, isso significa que os açúcares podem representar 100 calorias diárias. Para homens, isso significa que os açúcares podem representar 150 calorias diárias.
- Evite açúcar cristal e sobremesas doces.

2- Reduza os carboidratos refinados. Arroz branco, bolos, biscoitos de polvilho, alimentos assados feitos com farinha branca ou semolina podem elevar os triglicérides em alguns indivíduos; portanto, o seu nutricionista poderá determinar se isto é um problema. Se o nutricionista suspeitar que sim, reduzir os carboidratos refinados diminuirá rapidamente seus triglicérides.

- Em vez de comer carboidratos refinados, prefira pães integrais, macarrão integral e outros produtos feitos de grãos integrais.
- Evite dietas que eliminem muitos carboidratos de suas opções diárias – tais dietas normalmente contribuem para doenças cardíacas. A alta taxa de triglicérides por si só já causa um risco grande para seu coração.

3- Elimine o álcool. O álcool pode aumentar drasticamente os triglicérides, especialmente para aqueles que são sensíveis a ele. Independente de você ser sensível ou não, é altamente recomendável a eliminação do álcool da dieta durante o processo de diminuição de triglicérides.

- Cortar o consumo de bebidas alcoólicas ingeridas regularmente reduzirá seus triglicérides de maneira significativa.

- Você poderá reintroduzir gradativamente o álcool à sua dieta assim que os triglicerídeos atingirem um nível aceitável. Evite beber muito ou com grande regularidade, visto que isso poderia fazer o problema voltar.

4- Ômega-3. Os ácidos graxos Ômega-3 são considerados gorduras “boas”. O consumo regular desse ácido graxo pode ajudar seu organismo a desenvolver níveis menores de triglicerídeos.

- Coma duas porções de peixes gordurosos por semana. Haverá uma mudança imediata nos seus níveis de triglicerídeos se isso for feito consistentemente.
- Peixes gordurosos ricos em Ômega-3 incluem: Salmão, Sardinha, Atum, Truta e Cavala.
- Outras fontes de Ômega-3 são: Semente de Linhaça; Óleo de Linhaça; Soja; Legumes; Nozes; Vegetais folhosos e escuros. Misture essas fontes adicionais em sua dieta regularmente.

5- Consuma alimentos (plantados). Plantas contêm proteínas, e substituir carnes vermelhas por essas novas fontes pode diminuir diretamente seu colesterol dentro de semanas. Baixar o colesterol também significa diminuir os triglicerídeos.

- Feijões secos, ervilhas e produtos de soja são ricos em proteínas.
- De um jeito semelhante, você pode consumir frango para substituir a carne vermelha. Especialmente o peito de frango, devendo ser evitados os cortes de coxa e contra coxa; e a pele do frango.

6- Consuma muita fibra. A fibra ajuda a regular a absorção dos alimentos e a passagem deles. Alimentos ricos em fibras podem diminuir seus triglicerídeos e seu colesterol LDL.

- Aumente a quantidade de grãos integrais que você come. O **farelo de aveia** deverá fazer parte do seu plano alimentar. Você deve comer mais feijões, frutas e vegetais. **Inclui-se a laranja com bagaço.**

7- Monitore sua ingestão de gordura. Gorduras saturadas e gorduras trans podem ser especialmente danosas. Cortá-las de sua dieta pode afetar seus triglicerídeos de maneira positiva.

- Alimentos empacotados e fast-foods são os grandes responsáveis pelas gorduras “ruins”. Produtos animais e qualquer coisa feita com óleo vegetal hidrogenado pode ser um problema – assim como margarina, manteiga, banha e gordura vegetal.
- Opte por gorduras mono e poliinsaturadas. Seu corpo precisa ingerir gordura, mas essas fontes são consideradas mais saudáveis e não prejudicarão seus triglicerídeos. Elas são encontradas por exemplo no azeite de oliva extra virgem (acidez igual ou menor que 0,5).

8-Limite a frutose. Limitar os níveis de frutose para menos de 50 ou 100 gramas diárias pode ajudar a diminuir rapidamente seus níveis de triglicerídeos. A frutose é um açúcar natural que pode aumentar drasticamente os triglicerídeos quando consumida em excesso.

- Frutas com baixos níveis de frutose são: damascos, frutas cítricas, morangos, abacates e tomates.
- Frutas com altos níveis de frutose são: mangas, bananas, uvas, peras, maçãs, melancias, bananas-da-terra e amoras.

Mudanças de Atividades e de Estilo de Vida

Regule sua ingestão de calorias. Preste atenção em quantas calorias você consome por dia e consuma-as em porções menores. Siga a proposta alimentar prescrita pelo nutricionista:

- Isto é especialmente útil se você é obeso ou está acima do peso. O peso excessivo pode ser a fonte dos níveis elevados de triglicerídeos.
- Note que reduzir o número de calorias não resolve inteiramente o problema. Por outro lado, será difícil baixar seus triglicerídeos rapidamente caso mude a dieta sem monitorar a ingestão de calorias.
- A maioria das mulheres deve consumir menos calorias diárias, em relação aos homens. A sua proposta dietética visará caso você precise perder peso severamente. Você não deve assumir qualquer tipo de dieta milagrosa por conta própria.
- Coma porções menores. Para os mesmos fins, consumir refeições pequenas e frequentes é melhor do que ingerir duas ou três refeições grandes ao dia.
- A refeição café da manhã é de grande importância no seu metabolismo e perda de peso.
- Evite comer tarde da noite, logo antes de dormir.

Exercite-se. O exercício físico com moderação é parte essencial para a diminuição dos níveis de colesterol e triglicerídeos. Mas, atenção: sempre o faça com a autorização do seu médico.

- Resista à tentação de estabelecer um regime rigoroso de exercícios. Você pode pensar que começar direto com um programa desafiador de exercícios baixará seus triglicerídeos mais rapidamente, mas isso é uma péssima decisão em longo prazo. Começar com algo muito difícil aumenta a probabilidade de você desistir logo no início. O profissional educador físico saberá orientá-lo adequadamente.
- Seja criativo. Introduza variedade em seu programa de exercícios para evitar o tédio. Lembre-se, pode ser útil encontrar uma forma de exercício que você possa considerar divertida.

Pare de fumar. Será difícil reduzir os níveis de triglicerídeos se você for fumante e não quiser largar o hábito.

- Os níveis de triglicerídeos não são imediatamente afetados pelo fumo, mas o cigarro contribui para o aumento gradativo e contínuo do problema.
- O cigarro não é a única razão para seus triglicerídeos altos, mas ele é um fator. Você precisará largá-lo antes de fazer qualquer progresso real. Quanto mais cedo você desistir de fumar, mais rápido os níveis começarão a cair.
- Ao desistir de fumar, você também causará um impacto positivo nas condições cardíacas relacionadas aos níveis altos de triglicerídeos.

Medicações

Existem vários medicamentos no mercado que o seu médico poderá escolher e prescrever para cada caso individual. Nunca tome medicamentos sem o conhecimento médico.

APÊNDICE I – Orientação nutricional para de diabetes mellitus



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**Orientações Nutricionais para Diabetes Mellitus**

- ✓ Realizar 5 a 6 pequenas refeições por dia, em horários conforme estabelecidos;
- ✓ Usar adoçante com moderação ou utilizar os alimentos ao natural;
- ✓ Consumir vegetais, preferindo (grupo A) folhosos (acelga, agrião, alface, brócolis, repolho, couve, espinafre) e vegetais crus;
- ✓ Preferir alimentos integrais, como pães, biscoitos, arroz, aveia;
- ✓ Preferir carnes brancas (aves e peixes), retirando a pele antes das preparações;
- ✓ Fazer uma refeição leve antes de dormir: leite desnatado, iogurte, frutas;
- ✓ Ingerir aproximadamente 08 copos de água por dia.
- ✓ Cuidado com alimentos Diet ou Light, existem diferenças entre eles: alimentos DIET são aqueles que não têm necessariamente a função de emagrecer e que são elaborados para atender às pessoas com disfunção ou distúrbios metabólicos, como os diabéticos (sem açúcar) ou hipertensos (sem sódio). Alimentos LIGHT são aqueles com menor quantidade de algum nutriente do que o normal;
- ✓ Leia o rótulo dos produtos industrializados, assim você poderá verificar se o alimento contém açúcar.

EVITAR:

- ✓ Alimentos contendo açúcar: balas, bolo, doces, chocolates, refrigerantes, mel, rapadura, sorvetes, achocolatados;
- ✓ Farináceos: farinha de mandioca, amido de milho e outras que contenham açúcar na sua composição;
- ✓ Jejum prolongado ou excesso de alimentação;
- ✓ Frituras;
- ✓ Alimentos ricos em gordura animal, como leite integral, creme de leite, requeijão, bacon, manteiga, toucinho, banha, queijos amarelos, chouriço, charque, carnes gordurosas e vísceras;
- ✓ Bebidas alcoólicas e fumo;
- ✓ Caso seja hipertenso, evitar adoçantes dietéticos que contenham sódio.

APÊNDICE J – Orientação para alimentação e vida saudável

Orientações Nutricionais para uma Alimentação e Vida Saudável

Bons hábitos alimentares permitem atender às necessidades nutricionais, podendo proporcionar bem estar e saúde às pessoas.

- ✓ Mude os seus hábitos alimentares gradualmente;
- ✓ Procure fazer de cinco a seis refeições por dia, em horários regulares, variando bem os alimentos;
- ✓ Faça suas refeições em ambiente calmo e mastigue bem os alimentos;
- ✓ Evite consumir frituras, doces, embutidos, enlatados, conservas, refrigerantes e excesso de carne vermelhas (reduza se possível a carne vermelha para 1 vez/semana);
- ✓ Aumente o consumo de alimentos ricos em fibras. Elas estão presentes nos legumes, frutas, cereais integrais (aveia, linhaça etc) e leguminosas;
- ✓ Dê preferência ao consumo de alimentos naturais e carnes magras, em especial ovos, peixes e aves;
- ✓ Aproveite para consumir as frutas e verduras da época de safra, pois são mais saborosos, frescos, nutritivos e baratos;
- ✓ Aproveite a água de cozimento de legumes e verduras para preparação de sopas ou no cozimento de alimentos como feijão, arroz, etc;
- ✓ Sal e açúcar devem ser usados com muita cautela, o mínimo necessário;
- ✓ Evite o saleiro à mesa;
- ✓ Reduza o consumo de alimentos com alto teor de colesterol, como carnes gordas, queijos gordurosos, manteiga, aves com pele e peixes com pele escura;
- ✓ Procure ingerir frutas cítricas (ácidas) (acerola, limão, laranja etc.) após o almoço e jantar, pois são ricas em vitamina C e auxiliam na absorção do ferro;
- ✓ Observe a data de validade e o valor nutricional nos rótulos dos produtos, bem como a integridade das embalagens;
- ✓ Beba no mínimo dois litros de líquidos por dia, mas procure evitá-los durante as refeições;
- ✓ A prática de exercícios físicos é bastante saudável, promove a queima de calorias, favorece o condicionamento físico e controle da glicemia, entre outros benefícios (não pratique exercícios sem orientação médica e de um profissional da área).

ANEXOS

ANEXO A - Parecer favorável do Comitê de Ética Pesquisa

UNIVERSIDADE ESTADUAL DE
MONTES CLAROS -
UNIMONTES



PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Eficácia da intervenção nutricional educativa nos funcionários atendidos pelo Programa Mudança de Hábito & Estilo de Vida/Nutrição e Saúde da Universidade Estadual de Montes Claros

Pesquisador: Gislaíne Cândida Batista Jorge

Área Temática:

Versão: 1

CAAE: 08782812.6.0000.5146

Instituição Proponente: Universidade Estadual de Montes Claros - UNIMONTES

DADOS DO PARECER

Número do Parecer: 152.337

Data da Relatoria: 23/11/2012

Apresentação do Projeto:

O crescente aumento das doenças crônicas em níveis epidêmicos está relacionado às mudanças ocorridas nas últimas décadas na dieta e no estilo de vida. É sabido que a dieta e a atividade física são fatores importantes na promoção e na manutenção da saúde durante o ciclo de vida, e que características da dieta podem determinar não somente a saúde do indivíduo no momento atual, mas também desencadear o desenvolvimento das doenças crônicas não transmissíveis.

Objetivo da Pesquisa:

Avaliar a eficácia da intervenção nutricional educativa na recuperação e promoção da saúde, bem como a melhoria da qualidade de vida por meio de mudanças de hábito e do estilo de vida dos funcionários atendidos no ambulatório de nutrição clínica no Centro de Especialidades Tancredo Neves (CAETAN) Programa Nutrição e Saúde na Universidade Estadual de Montes Claros.

Avaliação dos Riscos e Benefícios:

Não há riscos.

benefícios: intervenção comportamental.

Comentários e Considerações sobre a Pesquisa:

O presente estudo será descritivo, quantitativo, longitudinal prospectivo, a ser realizado no ambulatório de Nutrição Clínica / Centro Ambulatorial de Especialidades Tancredo Neves - CAETAN / UNIMONTES localizado na cidade de Montes Claros Minas Gerais. O tamanho da amostra inicialmente calculado será de 320 indivíduos considerando-

Endereço: Av. Dr. Rui Braga s/n-Camp. Univers. Prof. Darcy Rib
 Bairro: Vila Mauricéia CEP: 38.401-080
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 Telefone: (38)3229-8180 Fax: (38)3229-8103 E-mail: maisa.leite@unimontes.br

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se um intervalo de confiança de 95%, $p < 0,05$ com um percentual máximo de ocorrência de 40% de distúrbios nutricionais em um universo de 2400 servidores (efetivos e efetivados) da UNIMONTES

Considerações sobre os Termos de apresentação obrigatória:

Dentro dos padrões e normas.

Recomendações:

não há.

Conclusões ou Pendências e Lista de Inadequações:

Sendo assim somos pela aprovação do projeto.

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

Considerações Finais a critério do CEP:

O Comitê de Ética em Pesquisa da Unimontes avaliou o projeto e entende que o mesmo atende os preceitos éticos da pesquisa envolvendo seres humanos. Sendo assim, somos pela aprovação do projeto.

MONTES CLAROS, 23 de Novembro de 2012

Assinador por:
Marta Tavares de Souza Leite
(Coordenador)

ANEXO B – Normas da revista para submissão do artigo 1

BJN Instructions for Contributors

British Journal of Nutrition (BJN) is an international peer-reviewed journal that publishes original papers and review articles in all branches of nutritional science. The underlying aim of all work should be to develop nutritional concepts.

SUBMISSION

This journal uses [ScholarOne Manuscripts](#) for online submission and peer review.

Complete guidelines for preparing and submitting your manuscript to this journal are provided below.

SCOPE

BJN encompasses the full spectrum of nutritional science and reports of studies in the following areas will be considered for publication: Epidemiology, dietary surveys, nutritional requirements and behavior, metabolic studies, body composition, energetics, appetite, obesity, ageing, endocrinology, immunology, neuroscience, microbiology, genetics, and molecular and cell biology. The focus of all manuscripts submitted to the journal must be to increase knowledge in nutritional science.

The journal does NOT publish papers on the following topics: Case studies; papers on food technology, food science or food chemistry; studies of primarily local interest; studies on herbs, spices or other flavouring agents, pharmaceutical agents or that compare the effects of nutrients to those of medicines, complementary medicines or other substances that are considered to be primarily medicinal agents; studies in which a nutrient or extract is not administered by the oral route (unless the specific aim of the study is to investigate parenteral nutrition); studies using non-physiological amounts of nutrients (unless the specific aim of the study is to investigate toxic effects); food contaminants.

In vivo and in vitro models

Studies involving animal models of human nutrition and health or disease will only be considered for publication if the amount of a nutrient or combination of nutrients used could reasonably be expected to be achieved in the human population.

Studies involving in vitro models will only be considered for publication if the amount of a nutrient or combination of nutrients is demonstrated to be within the range that could reasonably be expected to be encountered in vivo, and that the molecular form of the nutrient or nutrients is the same as that which the cell type used in the model would encounter in vivo.

Extracts

Studies involving extracts will only be considered for publication if the source of starting material is readily accessible to other researchers and that there are appropriate measures for quality control, that the method of extraction is described in sufficient detail with appropriate quality control measures, that the nutrient composition of the extract is characterized in detail and that there are measures to control the quality of the composition of the extract between preparations, and that the amount of extract used could reasonably be expected to be achieved in the human population (or in animals if they are the specific target of an intervention).

Studies involving extracts in vitro models will only be considered for publication if the above guidelines for studies involving extracts are followed, and that the amount and molecular form of the extract is the same as that which would be encountered by the cell type used in the model in vivo.

Probiotics

Studies involving probiotics may be considered provided that the primary focus of the study/review is the effects on nutrient absorption and/or metabolism. Studies/reviews that focus primarily on probiotics per se will not be considered.

Manuscripts submitted to BJN that are outside of the journal's scope or do not meet the above requirements will be rejected immediately.

REVIEW PROCESS

BJN uses a single blind review process.

As part of the online submission process, authors are asked to affirm that the submission represents original work that has not been published previously, and that it is not currently being considered by another journal. Authors must also confirm that each author has seen and approved the contents of the submitted manuscript. Finally, authors should confirm that permission for all appropriate uses has been obtained from the copyright holder for any figures or other material not in his/her copyright, and that the appropriate acknowledgement has been made to the original source.

At submission, authors are asked to nominate at least four potential referees who may then be asked by the Editorial Board to help review the work. Manuscripts are normally reviewed by two external peer reviewers and a member of the Editorial Board.

When substantial revisions are required to manuscripts after review, authors are normally given the opportunity to do this once only; the need for any further changes should at most reflect only minor issues. If a paper requiring revision is not resubmitted within 2 months, it may, on resubmission, be deemed a new paper and the date of receipt altered accordingly.

PUBLISHING ETHICS

BJN considers all manuscripts on the strict condition that:

The manuscript is your own original work, and does not duplicate any other previously published work;

The manuscript has been submitted only to the journal - it is not under consideration or peer review or accepted for publication or in press or published elsewhere;

All listed authors know of and agree to the manuscript being submitted to the journal; and

The manuscript contains nothing that is abusive, defamatory, fraudulent, illegal, libellous, or obscene.

The Journal adheres to the [Committee on Publication Ethics \(COPE\) guidelines](#) on research and publications ethics.

Text taken directly or closely paraphrased from earlier published work that has not been acknowledged or referenced will be considered plagiarism. Submitted manuscripts in which such text is identified will be withdrawn from the editorial process. If a concern is raised about possible plagiarism in an article submitted to or published in BJN, this will be investigated fully and dealt with in accordance with the COPE guidelines.

ARTICLE TYPES

BJN publishes the following: Research Articles, Review Articles, Systematic Reviews, Horizons in Nutritional Science, Workshop Reports, Invited Commentaries, Letters to the Editor, Obituaries, and Editorials.

Research Articles, Reviews, Systematic Reviews, Horizons Articles, Letters to the Editor and Workshop Reports should be submitted to <http://mc.manuscriptcentral.com/bjn>. Please contact the Editorial Office on bjn.edoffice@cambridge.org regarding any other types of article.

Review Articles

BJN is willing to accept critical reviews that are designed to advance knowledge, policy and practice in nutritional science. Current knowledge should be appropriately contextualised and presented such that knowledge gaps and research needs can be characterised and prioritised, or so that changes in policy and practice can be proposed along with suggestions as to how any changes can be monitored. The purpose or objective of a review should be clearly expressed, perhaps as question in the Introduction, and the review's conclusions should be congruent with the initial objective or question. Reviews will be handled by specialist Reviews Editors. Please contact the Editorial Office with any queries regarding the submission of potential review articles. All reviews, including systematic reviews and meta-

analyses, should present the uncertainties and variables associated with the papers and data being reviewed; in particular BJN cautions against uncritical acceptance of definitions and non-specific global terminology, the advice of advisory bodies, and reference ranges for example.

Reviews: These articles are written in a narrative style, and aim to critically evaluate a specific topic in nutritional science.

Horizons in Nutritional Science: These are shorter than Review articles and aim to critically evaluate recent novel developments that are likely to produce substantial advances in nutritional science. These articles should be thought-provoking and possibly controversial.

Systematic Reviews and meta-analyses: A systematic review or meta-analysis of randomised trials and other evaluation studies must be accompanied by a completed [Preferred Reporting Items for Systematic Reviews and Meta-Analyses \(PRISMA\)](#) Statement checklist, a guideline to help authors report a systematic review and meta-analysis (see British Medical Journal (2009) 339, b2535). Meta-analysis of observational studies must be accompanied by a completed [Meta-analysis of Observational Studies in Epidemiology \(MOOSE\)](#) reporting checklist, indicating the page where each item is included (see JAMA (2000) 283, 2008-2012). Manuscripts in these areas of review will not be sent for peer review unless accompanied by the relevant completed checklist.

Letters to the Editor

Letters are invited that discuss, criticise or develop themes put forward in papers published in BJN. They should not, however, be used as a means of publishing new work. Acceptance will be at the discretion of the Editorial Board, and editorial changes may be required. Wherever possible, letters from responding authors will be included in the same issue as the original article.

DETAILED MANUSCRIPT PREPARATION INSTRUCTIONS

Language

Papers submitted for publication must be written in English and should be as concise as possible. We recommend that authors have their manuscript checked by someone whose first language is English before submission, to ensure that submissions are judged at peer review exclusively on academic merit. Please see the Author Language Services section below for more information.

Spelling should generally be that of the Concise Oxford Dictionary (1995), 9th ed. Oxford: Clarendon Press. Authors are advised to consult a current issue in order to make themselves familiar with BJN as to typographical and other conventions, layout of tables etc. Sufficient

information should be given to permit repetition of the published work by any competent reader of BJN.

Published examples of BJN article types can be found below:

[Research Article](#)

[Review Article](#)

[Horizons Article](#)

[Letter to the Editor](#)

Authorship

The Journal conforms to the [International Committee of Medical Journal Editors \(ICMJE\)](#) definition of authorship, as described by P.C. Calder ([Br J Nutr \(2009\) 101, 775](#)).

Authorship credit should be based on:

Substantial contributions to conception and design, data acquisition, analysis and/or interpretation;

Drafting the article or revising it critically for important intellectual content; and

Final approval of the version to be published.

The contribution of individuals who were involved in the study but do not meet these criteria should be described in the Acknowledgments section.

Ethical standards

The required standards for reporting studies involving humans and experimental animals are detailed in an Editorial by G.C. Burdge ([Br J Nutr \(2014\) 112](#)).

Experiments involving human subjects

The notice of contributors is drawn to the guidelines in the World Medical Association (2000) Declaration of Helsinki: ethical principles for medical research involving human subjects, with notes of clarification of 2002 and 2004 (<http://www.wma.net/en/30publications/10policies/b3/>), the Guidelines on the Practice of Ethics Committees Involved in Medical Research Involving Human Subjects (3rd ed., 1996; London: The Royal College of Physicians) and the Guidelines for the ethical conduct of medical research involving children, revised in 2000 by the Royal College of Paediatrics and Child Health: Ethics Advisory Committee ([Arch Dis Child \(2000\) 82, 177–182](#)). Articles reporting randomised trials must conform to the standards set by the [Consolidated Standards of Reporting Trials \(CONSORT\) consortium](#).

Required disclosures: A paper describing any experimental work on human subjects must include the following statement in the Experimental Methods section: “This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the [insert name of the ethics committee; a specific ethics number may be inserted if you wish]. Written [or Verbal] informed consent was obtained from all subjects/patients. [Where verbal consent was obtained this must be followed by a statement such as: Verbal consent was witnessed and formally recorded].” For clinical trials, the trial registry name, registration identification number, and the URL for the registry should be included.

PLEASE NOTE: From 1 October 2014, as a condition for publication, all randomised controlled trials that involve human subjects submitted to BJN for review must be registered in a public trials registry. A clinical trial is defined by the ICMJE (in accordance with the definition of the World Health Organisation) as any research project that prospectively assigns human participants or groups of humans to one or more health-related interventions to evaluate the effects on health outcomes. Registration information must be provided at the time of submission, including the trial registry name, registration identification number, and the URL for the registry.

Experiments involving the use of other vertebrate animals

Papers that report studies involving vertebrate animals must conform to the ‘ARRIVE Guidelines for Reporting Animal Research’ detailed in Kilkenny et al. (J Pharmacol Pharmacother (2010) 1, 94-99) and summarised at www.nc3rs.org.uk. Authors must ensure that their manuscript conforms to the checklist that is available from the nc3Rs website. The attention of authors is drawn particularly to the ARRIVE guidelines point 3b (‘Explain how and why the animal species and model being used can address the scientific objectives and, where appropriate, the study’s relevance to human biology’, point 9c (‘Welfare-related assessments and interventions that were carried out prior to, during, or after the experiment’) and point 17a (‘Give details of all important adverse events in each experimental group’). The Editors will not accept papers reporting work carried out involving procedures that cause or are considered likely to cause distress or suffering which would confound the outcomes of the experiments, or experiments that have not been reviewed and approved by an animal experimentation ethics committee or regulatory organisation.

Required disclosures: Where a paper reports studies involving vertebrate animals, authors must state in the Experimental Methods section the institutional and national guidelines for

the care and use of animals that were followed and that all experimental procedures involving animals were approved by the [insert name of the ethics committee or other approving body; wherever possible authors should also insert a specific ethics/approval number].

Manuscript Format

The requirements of BJN are in accordance with the Uniform Requirements for Manuscripts Submitted to Biomedical Journals produced by the ICMJE.

Typescripts should be prepared with 1.5 line spacing and wide margins (2 cm), the preferred font being Times New Roman size 12. At the ends of lines, words should not be hyphenated unless hyphens are to be printed. Line numbering and page numbering are required.

Manuscripts should be organised as follows:

Cover letter

Papers should be accompanied by a cover letter including a brief summary of the work and a short explanation of how it advances nutritional science. The text for the cover letter should be entered in the appropriate box as part of the online submission process.

Title Page

The title page should include:

The title of the article;

Authors' names;

Name and address of department(s) and institution(s) to which the work should be attributed for each author;

Name, mailing address, email address, telephone and fax numbers of the author responsible for correspondence about the manuscript;

A shortened version of the title, not exceeding 45 characters (including letters and spaces) in length;

At least four keywords or phrases (each containing up to three words).

Authors' names should be given without titles or degrees and one forename may be given in full. Identify each author's institution by a superscript number (e.g. A.B. Smith¹) and list the institutions underneath and after the final author.

Abstract

Each paper must open with an unstructured abstract of not more than 250 words. The abstract should be a single paragraph of continuous text without subheadings outlining the aims of the work, the experimental approach taken, the principal results (including effect size and the results of statistical analysis) and the conclusions and their relevance to nutritional science.

Introduction

It is not necessary to introduce a paper with a full account of the relevant literature, but the introduction should indicate briefly the nature of the question asked and the reasons for asking it. It should be no longer than two manuscript pages.

Experimental methods

The methods section must include a subsection that describes the methods used for statistical analysis (see the section on statistical analysis in the [Appendix](#)) and the sample size must be justified by the results of appropriate calculations and related to the study outcomes.

For studies involving humans subjects or experimental animals, the Methods section must include a subsection that reports the appropriate ethical approvals for the study (see Ethical Standards above).

All analytical procedures must be accompanied by a statement of within and between assay precision.

Diets: The nutrient composition of diets used in studies published in BJN must be described in detail, preferably in a table(s). Experimentally relevant differences in composition between diets are essential. For instance, studies of fat nutrition should always include fatty acid compositions of all diets.

PCR analysis: Where experiments involve measurement of mRNA including microarray analysis, for analysis of individual genes, mRNA should be measured by quantitative RTPCR. A statement about the quality and integrity of the RNA must be provided together with the results of electrophoretic analysis of the purity of the PCR products. Unless published elsewhere, full details of the oligonucleotide primers and of the PCR protocol must be stated either in the text or in Supplementary Material. The stability of reference genes used for normalisation of PCR data must be reported for the experimental conditions described. Where possible, analysis of mRNA levels should be accompanied by assessment of either protein levels or activities.

Microarray analysis: Studies involving microarray analysis of mRNA must conform to the [“Minimum Information about a Microarray Experiment” \(MIAME\) guidelines](#) including deposition of the raw data in an appropriate repository (the Access Code must be stated in the Methods). All microarray experiments must be accompanied by appropriate validation by quantitative RTPCR.

Results

These should be given as concisely as possible, using figures or tables as appropriate. Data must not be duplicated in tables and figures.

Discussion

While it is generally desirable that the presentation of the results and the discussion of their significance should be presented separately, there may be occasions when combining these sections may be beneficial. Authors may also find that additional or alternative sections such as ‘conclusions’ may be useful. The discussion should be no longer than five manuscript pages.

Acknowledgments

Here you may acknowledge individuals or organizations that provided advice and/or support (non-financial). Formal financial support and funding should be listed in the following section.

Financial Support

Please provide details of the sources of financial support for all authors, including grant numbers. For example, “This work was supported by the Medical research Council (grant number XXXXXXXX)”. Multiple grant numbers should be separated by a comma and space, and where research was funded by more than one agency the different agencies should be separated by a semi-colon, with “and” before the final funder. Grants held by different authors should be identified as belonging to individual authors by the authors’ initials. For example, “This work was supported by the Wellcome Trust (A.B., grant numbers XXXX, YYYY), (C.D., grant number ZZZZ); the Natural Environment Research Council (E.F., grant number FFFF); and the National Institutes of Health (A.B., grant number GGGG), (E.F., grant number HHHH)”.

This disclosure is particularly important in the case of research that is supported by industry. Support from industry not only includes direct financial support for the study but also support in kind such as provision of medications, equipment, kits or reagents without charge or at reduced cost and provision of services such as statistical analysis; all such support must be disclosed here and if no such support was received this must be stated. Where no specific funding has been provided for research, please provide the following statement: “This research received no specific grant from any funding agency, commercial or not-for-profit sectors.”

In addition to the source of financial support, please state whether the funder contributed to the study design, conduct of the study, analysis of samples or data, interpretation of findings or the preparation of the manuscript. If the funder made no such contribution, please provide the following statement: “[Funder's name] had no role in the design, analysis or writing of this article.”

Conflict of Interest

Please provide details of all known financial, professional and personal relationships with the potential to bias the work. Where no known conflicts of interest exist, please include the following statement: “None.”

For more information on what constitutes a conflict of interest, please see the [International Committee of Medical Journal Editors \(ICMJE\) guidelines](#).

Authorship

Please provide a very brief description of the contribution of each author to the research. Their roles in formulating the research question(s), designing the study, carrying it out, analysing the data and writing the article should be made plain.

References

References should be numbered consecutively in the order in which they first appear in the text using superscript Arabic numerals in parentheses, e.g. ‘The conceptual difficulty of this approach has recently been highlighted^(1,2)’. If a reference is cited more than once, the same number should be used each time. References cited only in tables and figure legends should be numbered in sequence from the last number used in the text and in the order of mention of the individual tables and figures in the text.

Names and initials of authors of unpublished work should be given in the text as ‘unpublished results’ and not included in the References. References that have been published online only but not yet in an issue should include the online publication date and the Digital Object Identifier (doi) reference, as per the example below.

At the end of the paper, on a page(s) separate from the text, references should be listed in numerical order using the Vancouver system. When an article has more than three authors only the names of the first three authors should be given followed by ‘et al.’ The issue number should be omitted if there is continuous pagination throughout a volume. Titles of journals should appear in their abbreviated form using the [NCBI LinkOut page](#). References to books and monographs should include the town of publication and the number of the edition to which reference is made. References to material available on websites should follow a similar style, with the full URL included at the end of the reference, as well as the date of the version cited and the date of access.

Examples of correct forms of references are given below.

Journal articles

Rebello SA, Koh H, Chen C et al. (2014) Amount, type, and sources of carbohydrates in relation to ischemic heart disease mortality in a Chinese population: a prospective cohort study. *Am J Clin Nutr* 100, 53-64.

Villar J, Ismail LC, Victora CG et al. (2014) International standards for newborn weight, length, and head circumference by gestational age and sex: the Newborn Cross-Sectional Study of the INTERGROWTH-21st Project. *Lancet* 384, 857-868.

Alonso VR & Guarner F (2013) Linking the gut microbiota to human health. *Br J Nutr* 109, Suppl. 2, S21–S26.

Bauserman M, Lokangaka A, Gado J et al. A cluster-randomized trial determining the efficacy of caterpillar cereal as a locally available and sustainable complementary food to prevent stunting and anaemia. *Public Health Nutr*. Published online: 29 January 2015. doi: 10.1017/S1368980014003334.

Books and monographs

Bradbury J (2002) Dietary intervention in edentulous patients. PhD Thesis, University of Newcastle.

Ailhaud G & Hauner H (2004) Development of white adipose tissue. In *Handbook of Obesity. Etiology and Pathophysiology*, 2nd ed., pp. 481–514 [GA Bray and C Bouchard, editors]. New York: Marcel Dekker.

Bruinsma J (editor) (2003) *World Agriculture towards 2015/2030: An FAO Perspective*. London: Earthscan Publications.

World Health Organization (2003) *Diet, Nutrition and the Prevention of Chronic Diseases. Joint WHO/FAO Expert Consultation. WHO Technical Report Series no. 916*. Geneva: WHO.

Keiding L (1997) *Astma, Allergi og Anden Overfølsomhed i Danmark – Og Udviklingen 1987–1991 (Asthma, Allergy and Other Hypersensitivities in Denmark, 1987–1991)*. Copenhagen, Denmark: Dansk Institut for Klinisk Epidemiologi.

Sources from the internet

Nationmaster (2005) HIV AIDS – Adult prevalence rate. http://www.nationmaster.com/graph-T/hea_hiv_aid_adu_pre_rat (accessed June 2013).

Figures

Figures should be supplied as separate electronic files. Figure legends should be grouped in a section at the end of the manuscript text. Each figure should be clearly marked with its number and separate panels within figures should be clearly marked (a), (b), (c) etc. so that they are easily identifiable when the article and figure files are merged for review. Each figure, with its legend, should be comprehensible without reference to the text and should include definitions of abbreviations. The nature of the information displayed in the figures (e.g. mean (SEM)) and the statistical test used must be stated.

We recommend that only TIFF, EPS or PDF formats are used for electronic artwork. Other non-preferred but usable formats are JPG, PPT and GIF files and images created in Microsoft Word. Note that these non-preferred formats are generally NOT suitable for conversion to print reproduction. For further information about how to prepare your figures, including sizing and resolution requirements, please see our [artwork guide](#).

In curves presenting experimental results the determined points should be clearly shown, the symbols used being, in order of preference, ○, ●, △, ▲, □, ■, ×, +. Curves and symbols should not extend beyond the experimental points. Scale-marks on the axes should be on the inner side of each axis and should extend beyond the last experimental point. Ensure that lines and symbols used in graphs and shading used in histograms are large enough to be easily identified when the figure size is reduced to fit the printed page. Statistically significant effects should be indicated with symbols or letters.

Colour figures will be published online free of charge, and there is a fee of £350 per figure for colour figures in the printed version. If you request colour figures in the printed version, you will be contacted by CCC-Rightslink who are acting on our behalf to collect colour charges. Please follow their instructions in order to avoid any delay in the publication of your article.

Images submitted with a manuscript should be minimally processed; some image processing is acceptable (and may be unavoidable), but the final image must accurately represent the original data. Grouping or cropping of images must be identified in the legend and indicated by clear demarcation. Please refer to the [Office of Research Integrity guidelines](#) on image processing in scientific publication. Authors should provide sufficient detail of image-gathering procedures and process manipulation in the Methods sections to enable the accuracy of image presentation to be assessed. Authors should retain their original data, as Editors may request them for comparison during manuscript review.

Tables

Tables should be placed in the main manuscript file at the end of the document, not within the main text. Please do not supply tables as images (e.g. in TIFF or JPG format). Be sure that each table is cited in the text. Tables should carry headings describing their content and should be comprehensible without reference to the text. Tables should not be subdivided by ruled lines.

The dimensions of the values, e.g. mg/kg, should be given at the top of each column. Separate columns should be used for measures of variance (SD, SE etc.), the ± sign should not be used. The number of decimal places used should be standardized; for whole numbers 1.0, 2.0 etc. should be used. Shortened forms of the words weight (wt) height (ht) and experiment (Expt)

may be used to save space in tables, but only Expt (when referring to a specified experiment, e.g. Expt 1) is acceptable in the heading.

Footnotes are given in the following order: (1) abbreviations, (2) superscript letters, (3) symbols. Abbreviations are given in the format: RS, resistant starch. Abbreviations in tables must be defined in footnotes in the order that they appear in the table (reading from left to right across the table, then down each column). Symbols for footnotes should be used in the sequence: *†‡§||¶, then ** etc. (omit * or †, or both, from the sequence if they are used to indicate levels of significance).

For indicating statistical significance, superscript letters or symbols may be used. Superscript letters are useful where comparisons are within a row or column and the level of significance is uniform, e.g. ‘a,b,cMean values within a column with unlike superscript letters were significantly different ($P < 0.05$)’. Symbols are useful for indicating significant differences between rows or columns, especially where different levels of significance are found, e.g. ‘Mean values were significantly different from those of the control group: * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$ ’. The symbols used for P values in the tables must be consistent.

Supplementary material

Additional data (e.g. data sets, large tables) relevant to the paper can be submitted for publication online only, where they are made available via a link from the paper. The paper should stand alone without these data. Supplementary Material must be cited in a relevant place in the text of the paper.

Although Supplementary Material is peer reviewed, it is not checked, copyedited or typeset after acceptance and it is loaded onto the journal’s website exactly as supplied. You should check your Supplementary Material carefully to ensure that it adheres to journal styles. Corrections cannot be made to the Supplementary Material after acceptance of the manuscript. Please bear this in mind when deciding what content to include as Supplementary Material.

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ANEXO C – Normas da revista para submissão do artigo 2

Annals of Nutrition and Metabolism – Authors Guidelines

Manuscripts written in English are considered and should be submitted online

Should you experience problems with your submission, please contact:

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