UNIVERSIDADE DE BRASÍLIA
FACULDADE DE CIÊNCIAS DA SAÚDE
PROGRAMA DE PÓS-GRADUAÇÃO EM NUTRIÇÃO HUMANA

CONSUMO DE ULTRAPROCESSADOS DURANTE A GESTAÇÃO E ASSOCIAÇÃO COM DESFECHOS PERINATAIS E COMPOSIÇÃO NUTRICIONAL DA DIETA

WALKYRIA OLIVEIRA PAULA

BRASÍLIA
2023

UNIVERSIDADE DE BRASÍLIA
FACULDADE DE CIÊNCIAS DA SAÚDE
PROGRAMA DE PÓS-GRADUAÇÃO EM NUTRIÇÃO HUMANA

CONSUMO DE ULTRAPROCESSADOS DURANTE A GESTAÇÃO E ASSOCIAÇÃO COM DESFECHOS PERINATAIS E COMPOSIÇÃO NUTRICIONAL DA DIETA

Dissertação de Mestrado apresentada ao Programa de Pós-graduação em Nutrição Humana, Universidade de Brasília, para obtenção do título de Mestre em Nutrição Humana

Orientadora: Profa. Dra. Nathalia Marcolini Pelucio Pizato

BRASÍLIA
2023

WALKYRIA OLIVEIRA PAULA

CONSUMO DE ULTRAPROCESSADOS DURANTE A GESTAÇÃO E ASSOCIAÇÃO COM DESFECHOS PERINATAIS E COMPOSIÇÃO NUTRICIONAL DA DIETA

BANCA EXAMINADORA

Profª Drª Nathalia Marcolini Pelucio Pizato

Universidade de Brasília – Orientadora

Profª Drª Renata Junqueira Pereira

Universidade Federal do Tocantins – Membro Externo

Profª Drª Renata Puppin Zandonadi

Universidade de Brasília – Membro Interno

Profª Drª Kênia Mara Baiocchi de Carvalho

Universidade de Brasília - Suplente

AGRADECIMENTOS

Primeiramente a Deus, por ter me permitido chegar até aqui, me dando forças e capacidade para superar as dificuldades encontradas.

Aos meus pais, pelo amor incondicional, incentivo, apoio e compreensão em todos os momentos desta jornada.

Aos meus professores, em especial à minha orientadora, Nathalia Pizato, pela confiança, incentivo, apoio e que, com tanta dedicação, me direcionou e auxiliou no desenvolvimento deste trabalho.

Às queridas colegas Amanda Biete e Erika Patriota, por estarem comigo nesta jornada, pelo companheirismo e competência na tarefa que coube a nós.

Aos gestores das Unidades Básicas de Saúde do Distrito Federal pelo apoio na realização da coleta de dados.

Ao grupo do Estudo Multicêntrico da Deficiência de Iodo na População Materno-Infantil (EMDI-Brasil), do qual este estudo faz parte, pelo apoio logístico e organizacional nas fases de planejamento e execução deste estudo.

A todas as gestantes que aceitaram participar da pesquisa, por contribuírem com a ciência, tornando possível a realização desta pesquisa.

À banca de qualificação e defesa, por aceitarem participar destes momentos e compartilhar conhecimentos que enriqueceram este estudo.

A todos aqueles que torceram e participaram de alguma forma deste trabalho, muito obrigada.

RESUMO

Introdução: O alto consumo de alimentos ultraprocessados (UTP) tem sido associado ao aumento de doenças crônicas não transmissíveis, e à redução da qualidade da dieta em adultos saudáveis, ao mesmo tempo em que se observa o progressivo aumento do consumo destes alimentos pela população, incluindo gestantes. O maior consumo de energia proveniente de UTP afeta negativamente diferentes indicadores nutricionais e está associados ao desenvolvimento de doenças crônicas em mulheres grávidas e lactantes. A dieta materna adequada durante a gestação é um dos determinantes para a saúde materna e infantil a curto e longo prazos, sendo essencial para a prevenção de desfechos gestacionais negativos. **Objetivo:** Investigar o efeito do consumo de dietas ricas em UTP por gestantes em desfechos perinatais (ganho de peso gestacional, diabetes gestacional, desordens hipertensivas da gestação, peso ao nascer e prematuridade) e sobre a composição nutricional da dieta materna. **Método**: O efeito do consumo de dietas ricas em UTP sobre desfechos perinatais foi analisado por meio de revisão sistemática, conduzida conforme as diretrizes do *Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols* (PRISMA). A busca compreendeu as seguintes bases de dados: Medline (PubMed), Embase, Scopus, Web of Science, Literatura Científica e Técnica da América Latina e Caribe (Lilacs), Google Scholar e ProQuest Dissertations & Theses Global. Foram incluídos estudos observacionais que reportavam medida de associação entre pelo menos um alimento classificado como UTP pela NOVA e desfechos perinatais. A metanálise foi calculada a partir do modelo de efeitos aleatórios e ponderada pelo inverso da variância pelo método proposto por DerSimonian–Laird. O impacto do consumo materno de UTP sobre a qualidade nutricional da dieta foi avaliado por meio de estudo transversal, conduzido em gestantes em acompanhamento pré-natal em dez Unidades Básicas de Saúde (UBS) do Distrito Federal (DF). O consumo alimentar foi avaliado por dois recordatórios de 24 horas, em dias não consecutivos, e categorizados pela extensão do processamento usando a classificação NOVA. Modelos de regressão linear multivariada foram utilizados para analisar a associação entre os quintis de consumo de UTP e a ingestão de nutrientes. **Resultados:** A revisão sistemática incluiu 61 estudos, totalizando 698.803 participantes. A metanálise dos estudos de coorte indicou que o consumo de dietas ricas em UTP na gestação está associado a maior risco de Diabetes Mellitus Gestacional (DMG) [*Odds Ratio* (OR)= 1,48; intervalo de confiança 95% (IC): 1,17; 1,87] e pré-eclâmpsia [OR: 1,28; 95% IC: 1,15, 1,42]. O estudo transversal incluiu 229 gestantes, com idade média de 28 ± 6.2 anos. A ingestão energética média diária foi de 1741 ± 646 kcal. Em média, as gestantes consumiram 64,3 ± 18,2% da energia total de alimentos in natura ou minimamente processados, 4,5 ± 4,3% de ingredientes culinários, 8,6 ± 9,9% de alimentos processados e 22,6 ± 17,2% de UTP. O maior consumo de UTPs foi associado à redução da ingestão de alimentos *in natura/*minimamente processados e ingredientes culinários pelas gestantes atendidas nas UBS do DF. Ademais, o maior consumo de UTP esteve associado positivamente com maior ingestão total de energia, gordura trans e sódio; e inversamente associado ao teor de proteína, fibra, ferro, magnésio, potássio, cobre, zinco, selênio e folato da dieta. **Conclusão**: O maior consumo de dietas ricas em UTP durante a gestação está associado a desfechos maternos adversos e impacta na redução da qualidade nutricional da dieta. Estes resultados destacam a necessidade de monitorar e reduzir o consumo de UTP, especificamente durante o período gestacional, como estratégia para prevenir

desfechos perinatais adversos e mostram a necessidade da adoção de melhores estratégias para educação alimentar e nutricional para esta população.

Palavras-chave: Processamento dos alimentos; Gestantes; Diabetes Mellitus Gestacional; Pré-eclâmpsia; Consumo Alimentar

ABSTRACT

Introduction: High consumption of ultra-processed foods (UPF) has been associated with increased non-communicable chronic diseases, and lower overall diet quality in healthy adults. At the same time, there is a progressive increase in the consumption of these foods by the population, including pregnant women. Higher energy consumption from UTP negatively affects different indicators of nutrition and it is associated with chronic disease development in pregnant and lactating women. Adequate maternal diet during pregnancy is one of the determinants of maternal and child health in the short and long term, and it is essential for preventing adverse perinatal outcomes. **Objective:** To review the effect of maternal ultra-processed foods consumption on perinatal outcomes (gestational weight gain, gestational diabetes, hypertensive disorders of pregnancy, birth weight and preterm birth), and to investigate the impact of UPF consumption during pregnancy on the nutritional quality of the maternal diet. **Method:** The effect of the consumption of UTP-rich diets on perinatal outcomes was analyzed through a systematic review, which was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA). The following databases were searched: Medline (PubMed), Embase, Scopus, Web of Science, Scientific and Technical Literature from Latin America and the Caribbean (Lilacs), Google Scholar, and ProQuest Dissertations & Theses Global. Observational studies reporting an association measure between at least one food from the UPF group and perinatal outcomes were included. Meta-analysis was conducted according to the random-effects model. The impact of maternal UPF consumption on the nutritional quality of the diet was evaluated through a cross-sectional study, conducted with pregnant women who followed-up prenatal care in ten Primary Health Care (PHC) units in the Federal District (FD). Food consumption was assessed using two non-consecutive 24-hour food recall and categorized according to the extent and purpose of processing using NOVA classification. Multivariate linear regression models were used to analyze the association between quintiles of UPF consumption and nutrient intake. **Results:** The systematic review included 61 studies. The overall population included 698.803 women from all gestational trimesters. Meta-analysis of cohort studies showed that consumption of UPF foods during pregnancy is associated with an increased risk of Gestational Diabetes Mellitus (GDM) [Odds Ratio (OR)= 1.48; 95% confidence interval (CI): 1.17, 1.87] and preeclampsia [OR: 1.28; 95% CI: 1.15, 1.42]. The cross-sectional study included 229 pregnant women and the mean age was 28 ± 6.2 years. The average daily energy intake was 1741 ± 646 kcal. On average, pregnant women consumed 64.3 ± 18.2% of their total energy from unprocessed or minimally processed foods, 4.5 ± 4.3% from culinary ingredients, 8.6 ± 9.9% from processed foods and 22 .6 ± 17.2% of UPF. Higher consumption of UPF was associated with reduced intake of unprocessed/minimally processed foods and culinary ingredients by

pregnant women assisted at PHC units in the FD. Furthermore, it was positively associated with higher total energy, trans fat and sodium intake; and inversely associated with the diet's protein, fiber, iron, magnesium, potassium, copper, zinc, selenium, and folate content. **Conclusion:** Higher consumption of UPF-rich diets during pregnancy is associated with adverse maternal outcomes and lower nutritional quality of the diet. These results highlight the need to monitor and reduce the consumption of UPF, especially during the gestational period, as a strategy to prevent adverse perinatal outcomes, and show the need to adopt better strategies for food and nutrition education for this population.

Keywords: food processing; pregnant woman; gestational diabetes mellitus; preeclampsia; food intake

Sumário

Tabelas

Tabela da dissertação

Tabelas do artigo de Revisão Sistemática

Tabelas do artigo Original

Figuras

Figura da dissertação

Figuras do artigo de Revisão Sistemática

Apêndices

Lista de Abreviaturas e Siglas

ADA	American Diabetes Association
APS	Atenção Primária à Saúde
BVS	Biblioteca Virtual em Saúde
BPN	Baixo Peso ao Nascer
CI	Confidence Interval/Intervalo de Confiança
DMG	Diabetes Mellitus Gestacional
DHEG	Desordens Hipertensivas Específicas da Gestação
DUM	Data da Última Menstruação
EMDI	Estudo Multicêntrico sobre Deficiência de Iodo
GIG	Grande para Idade Gestacional
GPG	Ganho de Peso Gestacional
HAPO	Hiperglycemia and Adverse Pregnany Outcomes
HAS	Hipertensão Arterial Sistêmica
IBGE	Instituto Brasileiro de Geografia e Estatística
IDF	International Diabetes Federation
IOM	Institute of Medicine
IMC	Índice de Massa Corporal
JBI	Joanna Briggs Institute
OMS	Organização Mundial de Saúde
OR	Odds Ratio
PA	Pressão Arterial
PE	Pré-eclâmpsia
PPG	Peso pré-gestacional
PRESS	Peer Review of Electronic Search Strategies
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-analysis
PROSPERO	Prospective Register of Systematic Reviews
RR	Risco Relativo
SBD	Sociedade Brasileira de Diabetes
SISVAN	Sistema de Vigilância Alimentar e Nutricional
UBS	Unidade Básica de Saúde
UTP	Ultraprocessado(s)
WHO	World Health Organization

APRESENTAÇÃO

Esta dissertação apresenta os dados de consumo alimentar das gestantes atendidas nas Unidades Básicas de Saúde do Distrito Federal, com foco na classificação dos alimentos de acordo com o sistema NOVA. Estes dados são derivados do Estudo multicêntrico sobre deficiência de iodo (EMDI Brasil), conduzido entre 2019 e 2021. O projeto foi aprovado pelo Comitê de Ética em Pesquisa em seres humanos da Faculdade de Ciências da Saúde da Universidade de Brasília (UnB), 80172617.0.2008.0030 e parecer: 2.977.035 e pela Fundação de Ensino e Pesquisa em Ciências da Saúde (FEPECS), sob o número CAAE: 09940819.2.3001.5553 e parecer: 3.489.243.

No contexto da trajetória acadêmica como aluna do cuso de Nutrição da UnB, a oportunidade de trabalhar com a promoção da alimentação saudável e saúde pública surgiu durante a graduação, por meio do projeto de extensão CASA, da Universidade de Brasília. Neste período, participei do desenvolvimento de atividades de educação alimentar e nutricional voltadas para diversos públicos, que incluíam orientações sobre e redução do consumo de alimentos ultraprocessados (UTP), subsidiadas pelo Guia Alimentar para a População Brasileira. Ainda durante a graduação, fui contemplada com uma bolsa de estudos para graduação sanduíche na *University of Illinois at Urbana-Champaign* (EUA), por meio do programa Ciências sem Fronteiras, ofertado pela Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) – Brasil. Nesse período, tive a oportunidade de participar do projeto de extensão *NutrImpact*, focado em intervenções de educação alimentar e nutricional com escolares, incentivando maior consumo de frutas e hortaliças e redução do consumo de alimentos industrializados não saudáveis.

Durante o desenvolvimento do mestrado pelo Programa de Pós-graduação em Nutrição Humana (PPGNH) na UnB, publicamos uma revisão sistemática (RS) que avaliou o efeito do consumo de dietas ricas em alimentos UTP sobre desfechos adversos em saúde materna e infantil. A RS indicou que o maior consumo de dietas ricas em alimentos UTP durante a gestação está associado a maior risco de Diabetes Mellitus Gestacional (DMG) e pré-eclâmpsia.

Considerando as recentes evidências sobre o impacto do consumo de dietas ricas em UTP na saúde de diferentes populações, buscamos identificar a associação do consumo destes alimentos com a qualidade nutricional da dieta em gestantes acompanhadas nas unidades básicas do Distrito Federal, a partir dos dados do projeto EMDI, dando origem ao artigo original desta dissertação.

Para o desenvolvimento e publicação dos artigos, a pesquisa foi contemplada com editais de auxílio financeiro do Decanato de Pós-Graduação da Universidade de Brasília, do PPGNH e da CAPES.

A dissertação está dividida em seis tópicos: 1. Introdução; 2. Referencial teórico, onde são abordados os temas relativos aos aspectos nutricionais da gestação e consumo de dietas ricas em ultraprocessados, bem como dados referentes aos desfechos adversos maternos e infantis mais prevalentes; 3. Objetivos; 4. Métodos; 5. Resultados e Discussão, descritos sob a forma de dois artigos publicados, sendo uma revisão sistemática com meta-análise e um estudo original; e 6 Conclusão. Ressalta-se que parte do referencial teórico e dos métodos descritos fazem parte tanto da dissertação, como também dos artigos publicados. Optou-se por este formato, a fim de contemplar todas as etapas do desenvolvimento da pesquisa de forma mais detalhada, e por ser uma recomendação do Programa de Pós-Graduação em Nutrição Humana da Universidade de Brasília.

1. Introdução

A gestação é um período caracterizado por alterações fisiológicas e metabólicas importantes, no qual a dieta e o ganho de peso gestacional (GPG) são determinantes para desfechos perinatais adversos a curto e longo prazo, como a ocorrência de hipertensão e diabetes gestacional, prematuridade e peso ao nascer. Além disso, outros desfechos como baixo peso ao nascer e nascimento prematuro estão relacionados ao desenvolvimento de diabetes tipo 2, hipertensão e doenças cardiovasculares na vida adulta mostrando a importância da relação gestação saudável e saúde do adulto (MENDONÇA et al., 2020; WHO, 2016).

Embora a gestação seja um período importante na vida da mulher e a alimentação desempenhe um papel crucial na saúde materno-fetal, o padrão alimentar das gestantes tem acompanhado o da população adulta geral, demonstrando que essas mulheres estão vulneráveis à transição alimentar e nutricional observada na população brasileira (MARTINS et al., 2013).

A classificação dos alimentos de acordo com a extensão e finalidade tem se tornado um aspecto relevante da qualidade da dieta. Neste sentido, a classificação NOVA categoriza os alimentos de acordo com a extensão e o propósito do processamento distribuídos em quatro grupos: *in natura*, minimamente processados, processados e ultraprocessados (UTP) (MONTEIRO et al., 2016).

Os alimentos classificados pela NOVA como UTP apresentam formulações industriais obtidas a partir de substâncias extraídas ou refinadas dos alimentos *in natura*. Algumas dessas substâncias são submetidas à hidrólise, hidrogenação, ou outras modificações químicas. O alto consumo de dietas ricas em alimentos UTP é de particular relevância para a saúde pública, pois, estes alimentos são frequentemente adicionados de alta quantidade de açúcar, óleos/gorduras e sal, além de aditivos sintéticos como corantes, aromatizantes, emulsificantes e espessantes ou outros ingredientes de uso exclusivamente industrial, tornando-os intrinsecamente não saudáveis (MONTEIRO et al., 2019).

O consumo de alimentos UTP em diferentes países tem se tornado cada vez mais dominante no sistema alimentar, dada à facilidade de acesso e de consumo, bem como o baixo custo, caracterizado pelo aumento da prevalência do consumo de *fast foods*, bebidas açucaradas, biscoitos, e *snacks*, alimentos tipicamente com elevada densidade energética e baixo teor de fibras, vitaminas e minerais (MONTEIRO et al., 2013). O alto consumo destes alimentos está associado a maior risco de obesidade e síndrome metabólica, doenças cardiovasculares e aumento de mortalidade em adultos saudáveis (CHEN et al., 2020; DICKEN; BATTERHAM, 2021; ELIZABETH et al., 2020; PAGLIAI et al., 2021). É interessante ressaltar que o consumo

de UTP está associado a doenças crônicas como cardiovasculares (BONACCIO et al., 2022) e câncer de colorretal (WANG et al., 2022) independentemente da qualidade da dieta. Recente revisão de 37 estudos de coorte mostra que a associação entre o maior consumo de UTP e várias doenças crônicas persistem mesmo após o controle pelo perfil nutricional da dieta (DICKEN; BATTERHAM, 2021).

No Brasil, o aumento do consumo de UTP tem sido acompanhado de redução significativa no consumo de frutas e hortaliças (IBGE, 2020a). Apesar da recomendação do Guia Alimentar para a População Brasileira reforçar a importância de maior consumo de alimentos in natura e minimamente processados (BRASIL, 2014), dados da Pesquisa Nacional de Saúde revelaram alto consumo de alimentos considerados UTP no Brasil, sendo que 14,3% da população consumia cinco ou mais grupos de alimentos processados (IBGE, 2020b).

Apesar da evidente relação entre a qualidade da dieta durante a gestação e saúde materna e fetal, observa-se o aumento no consumo de UTP no período gestacional. Estudo longitudinal conduzido com 45 gestantes americanas observou que a ingestão de UTP nesta população correspondia a mais da metade das calorias ingeridas no dia (54,4%) (ROHATGI et al., 2017). No Brasil, alguns estudos observaram que os alimentos UTP contribuíram, em média, entre 18,2% a 25,4% das calorias diárias das gestantes (GOMES et al., 2020; MIELE et al., 2022; PAULINO et al., 2020).

Nesse cenário, há crescente investigação buscando estabelecer o efeito do consumo de alimentos UTP sobre desfechos perinatais, no entanto, os resultados ainda são limitados e inconsistentes. Algumas coortes reportaram significante associação entre consumo de UTP e maior GPG (GOMES et al., 2020; ROHATGI et al., 2017), risco de Diabetes Mellitus Gestacional (DMG) (LAMYIAN et al., 2017), pré-eclâmpsia (BORGEN et al., 2012), baixo peso ao nascer (AMEZCUA-PRIETO et al., 2019) e nascimento prematuro (GRIEGER; GRZESKOWIAK; CLIFTON, 2014). Em contraste, outros estudos relataram resultados divergentes, onde nenhuma associação foi encontrada entre o consumo destes alimentos na gestação e maior risco de DMG e prematuridade, por exemplo (LEONE et al., 2021; SARTORELLI et al., 2019). Revisões sistemáticas prévias têm explorado a associação da qualidade da dieta com desfechos maternos ou infantis isolados (CHIA et al., 2019; KINSHELLA et al., 2021; MIRANDA; SOUZA; SANTOS, 2021), mas não avaliaram o efeito do consumo de dietas ricas em UTP em gestantes e desfechos perinatais.

Ademais, há evidências crescentes de que o alto consumo de UTPs afeta negativamente a qualidade nutricional da dieta da população adulta, pois está associado ao aumento de açúcares livres, gorduras totais e gorduras saturadas, bem como à diminuição da

ingestão de nutrientes como fibras, proteínas, potássio, zinco, magnésio e vitaminas A, C, D, E, B12 e B3 (LOUZADA et al., 2015; MARTÍNEZ STEELE et al., 2017; MARTINI et al., 2021). No entanto, ainda são escassos os dados sobre o consumo de UTPs em gestantes no Brasil e o seu impacto no perfil nutricional e qualidade da dieta.

Nesse contexto, verifica-se a necessidade de revisar sistematicamente o efeito do consumo de dietas ricas em alimentos UTP por gestantes, conforme definido pela NOVA, sobre desfechos perinatais adversos, e investigar o impacto sobre o perfil nutricional da dieta, considerando o papel crucial do consumo alimentar na saúde do binômio mãe-filho. Atuais evidências sobre esse aspecto são essenciais para orientar o planejamento de ações de atenção à saúde e a promoção da alimentação adequada e saudável, além de intervenções nutricionais nos serviços de pré-natal.

2. Referencial Teórico

2.1. Aspectos Nutricionais da Gestação

A gestação é um período de adaptações nos aspectos fisiológicos, metabólicos e endócrinos da mulher, que requerem o aumento das demandas nutricionais, tendo em vista a adaptação de diferentes sistemas como o cardiovascular (aumento de débito cardíaco), hematológico (aumento de volume plasmático), respiratório (maior consumo de oxigênio), gastrointestinal (funcionamento intestinal) e funções endócrinas (elevação de estrogênio e progesterona, resistência à insulina) da gestante (VITOLO, 2014).

Nesta fase, fatores socioeconômicos e psicossociais, ingestão alimentar e GPG são determinantes da saúde materna durante e após a gestação, e do crescimento e desenvolvimento do feto, bem como da saúde da criança ao longo da vida (HILL et al., 2019).

O consumo alimentar durante a gestação pode apresentar potencial impacto sobre mecanismos que influenciam alterações metabólicas futuras, uma vez que mudanças epigenéticas respondem às condições ambientais uterinas e podem induzir alterações permanentes funcionais e estruturais no sistema metabólico. O excesso ou a privação de nutrientes neste período pode levar a alterações nos padrões normais de crescimento do bebê resultando em maior risco de desenvolvimento futuro de doenças como obesidade, diabetes, e doenças cardiovasculares (DEVLIN; BOUXSEIN, 2012; DUQUE-GUIMARÃES; OZANNE, 2013; G. CLIFTON et al., 2016).

Está bem estabelecido na literatura a importância do estilo de vida saudável antes e durante a gestação. Diversos estudos destacam os benefícios da alimentação saudável, rica em frutas, hortaliças, fibras e micronutrientes, e os efeitos adversos de um padrão alimentar com predominância de alimentos UTPs ricos em açúcar, sal e gordura, sobre desfechos perinatais (ABBASI; BAKHSHIMOGHADDAM; ALIZADEH, 2019; ALVES-SANTOS et al., 2019; ASADI et al., 2019; MAHMASSANI et al., 2022; OLIVEIRA et al., 2022).

Apesar da evidente relação entre o padrão alimentar durante a gestação e desfechos perinatais, os estudos que avaliaram a dieta no período perinatal mostraram a qualidade da dieta aquém do ideal (DEIERLEIN et al., 2021; ROJHANI et al., 2021). Desse modo, é importante ressaltar que o período perinatal é apontado como uma janela de oportunidade para intervenções nutricionais e prevenção de complicações perinatais, como diabetes e hipertensão gestacional, ganho de peso excessivo e nascimento prematuro (POON et al., 2018). A atenção anteriormente voltada principalmente para desnutrição agora se volta para o consumo excessivo, principalmente de alimentos não saudáveis, considerando os riscos para saúde a curto e longo prazo, incluindo o GPG excessivo, o desenvolvimento de DMG, desordens hipertensivas, e desfechos neonatais adversos como prematuridade, doença cardíaca congênita, e baixo peso ao nascer (DOMINGUEZ et al., 2014; IKEM et al., 2019).

O papel de nutrientes isolados na gestação tem sido amplamente explorado na literatura. No entanto, a despeito da importância dessa abordagem na investigação da relação entre componentes dietéticos e desfechos em saúde, ela não considera a interação sinérgica entre os nutrientes e os alimentos. Desse modo, é crucial que a atenção seja também voltada para a composição global da dieta com ênfase nos alimentos frequentemente consumidos, pois, estes refletem o padrão alimentar e as complexas interações entre nutrientes e alimentos que potencialmente impactam na saúde gestacional (MIELE et al., 2021).

2.2. Consumo de alimentos ultraprocessados: classificação NOVA

O sistema de classificação NOVA propõe que os alimentos sejam categorizados em quatro grupos, tendo como base a extensão e a finalidade do processamento industrial: (1) alimentos *in natura* ou minimamente processados, que são aqueles obtidos diretamente de plantas ou animais sem qualquer alteração ou que são submetidos a alterações mínimas como, por exemplo, processos de limpeza, fracionamento e congelamento; (2) ingredientes culinários, que são aqueles extraídos do primeiro grupo, como açúcar, azeite, manteiga sal; (3) alimentos processados, que passam por adição de ingredientes como sal, açúcar ou gordura; e (4)

alimentos ultraprocessados, que são formulações industriais desenvolvidas a partir de substâncias extraídas de alimentos, e adicionadas de diversos ingredientes como óleos, gordura, açúcar e amido, e frequentemente são utilizados aditivos artificiais, majoritariamente de uso industrial (MONTEIRO et al., 2010, 2016). Essa classificação é ilustrada na figura 1.

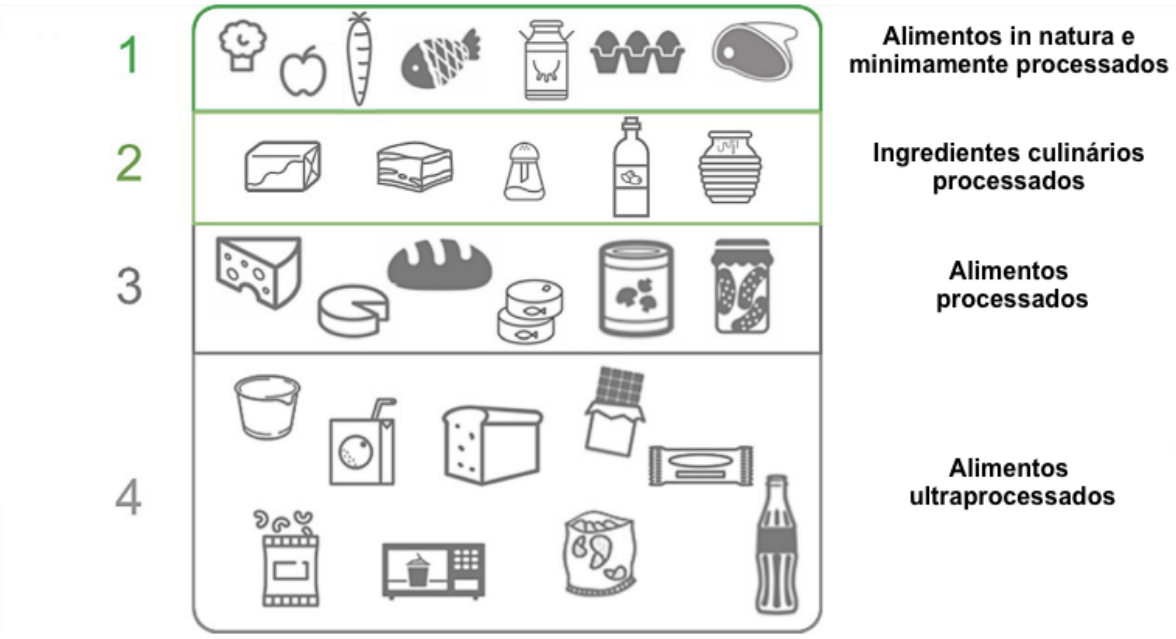


Figura 1. Classificação NOVA dos alimentos. Fonte: Adaptado de FARDET, 2018

Os alimentos UTP, em sua maioria, são tipicamente prontos para consumo ou de rápido preparo, têm alta densidade energética e alto índice glicêmico, são ricos em açúcar, sódio e gordura e possuem reduzido teor de fibras e micronutrientes. Essa categoria inclui alimentos como doces, *fast foods*, *snacks*, sorvetes, chocolates, refrigerantes, margarina, biscoitos, cereais matinais, e carnes processadas como salsicha e hambúrguer (FARDET et al., 2015; MONTEIRO et al., 2019). Esses produtos são fabricados e vendidos por grandes empresas e apresentam vantagens comerciais sobre os alimentos *in natura*, já que o custo, a conveniência, a durabilidade e a palatabilidade juntamente às agressivas estratégias de marketing contribuem para o maior consumo de alimentos UTP e consequente redução do consumo de alimentos frescos (MONTEIRO et al., 2013).

Os UTP representam uma parte crescente da oferta mundial de alimentos e estão se tornando dominante no sistema alimentar global. O contínuo aumento no consumo destes produtos tem sido observado mundialmente. No Reino Unido os alimentos UTP correspondem a 56,8% da ingestão total de energia e 64,7% do total de açúcares livres da dieta (RAUBER et al., 2019). Nos Estados Unidos, o consumo destes alimentos entre a população adulta cresceu

de 53,5% em 2001 para 57% em 2018 (JUUL et al., 2022). No Canadá, quase metade das calorias (45,7%) consumidas diariamente pela população são provenientes de alimentos UTP (POLSKY; MOUBARAC; GARRIGUET, 2020). No Brasil os dados também são alarmantes, uma vez que o consumo aumentou de 12,6% em 2002 para 18,4% em 2018 e, ao mesmo tempo, a ingestão de alimentos *in natura* ou minimamente processados reduziu de 53,3% para 49,5% (IBGE, 2020a).

Essa mudança global nos padrões alimentares tem impulsionado a epidemia da obesidade e o aumento na prevalência de doenças crônicas não transmissíveis, principalmente diabetes, doenças cardiovasculares e câncer (ZOBEL et al., 2016). Estudo de revisão sistemática mundial concluiu que, na população adulta, o consumo destes alimentos está associado com aumento significativo de excesso de peso, maior circunferência da cintura, menor nível de colesterol HDL e síndrome metabólica (PAGLIAI et al., 2021).

O aumento no consumo de alimentos UTP também tem sido observado no Brasil durante a gestação, mostrando que estes alimentos representam percentual importante das calorias diárias ingeridas no período gestacional. Em um estudo de coorte conduzido com 125 em gestantes conduzida foi observado que os alimentos UTP foram responsáveis por 25,4% das calorias diárias e, ainda, que o consumo de açúcar e sódio excederam a recomendação (PAULINO et al., 2020). Outro estudo, que avaliou a ingestão calórica de 1.145 gestantes por regiões do Brasil, encontrou no Sul/sudeste o consumo de 22,6% das calorias diárias provenientes de UTP, no nordeste o percentual foi 18,2% (MIELE et al., 2022). Em São Paulo, estudo conduzido com 259 gestantes reportou que estes alimentos foram responsáveis por 24,8% das calorias diárias da dieta das gestantes investigadas (GOMES et al., 2020).

Este padrão de consumo também tem sido observado em outros países. Estudo longitudinal incluindo 3.730 gestantes na Espanha mostrou que os alimentos UTP contribuíram com 29,7% das calorias diárias (LEONE et al., 2021). Nos EUA esse consumo chegou a mais da metade das calorias diárias, onde Rohatgi e colaboradores (2017) avaliaram 45 gestantes e encontraram uma média de 54,4% da ingestão energética obtida a partir de produtos UTP e esteve associada a um aumento de GPG e de gordura corporal do neonato. Outro estudo conduzido com 458 gestantes nos Estados Unidos demonstrou que, em média, os UTPs contribuíram com 52,6% das calorias totais diárias, e esteve associado a menor qualidade da dieta, além de maior ingestão de grãos refinados e açúcar de adição (NANSEL et al., 2022).

Assim como na comparação entre países, o nível de desenvolvimento econômico dos estados brasileiros parece influenciar as proporções de consumo de alimentos UTP. As

diferenças podem estar relacionadas às questões socioeconômicas, culturais e a padrões alimentares (COSTA et al., 2021).

2.3. Ganho de peso gestacional (GPG)

O ganho de peso materno durante a gestação é considerado importante determinante de desfechos perinatais. Esse ganho é influenciado pelas mudanças fisiológicas e metabólicas maternas e, ainda, pelo metabolismo placentário. Além disso, o GPG total é determinado por outros fatores, tais como sociodemográficos, familiares, culturais, ambientais e comportamentais, que incluem práticas de atividade física e dieta.

O GPG recomendado pelo Instituto de Medicina (2009) é estabelecido a partir do IMC pré-gestacional e considera, para gravidez única, os seguintes valores: mulheres com baixo peso (<18,5kg/m²) devem ganhar entre 12,5 a 18kg; para mulheres dentro da faixa normal de IMC (18,5-24,9kg/m²), o ganho recomendado ao longo da gestação é de 11,4 a 15,9kg; para mulheres com sobrepeso (24,9-29,9kg/m²), o ganho ideal reduz para a faixa de 6,9 a 11,4kg; mulheres com obesidade (>30kg/m²) devem ganhar entre 5 e 9kg.

Apesar da recomendação do IOM ser amplamente conhecida, outras curvas locais e internacionais de monitoramento do GPG têm sido desenvolvidas. No Brasil, recentemente, pesquisadores desenvolveram uma nova proposta de curvas que fornecem uma descrição do GPG de acordo com a idade gestacional e IMC pré-gestacional para mulheres brasileiras saudáveis. Esta ferramenta permite monitoramento contínuo ao longo da gestação conforme a semana gestacional (KAC et al., 2021).

A literatura mostra que tanto o GPG insuficiente como excessivo neste período são fatores de risco para a saúde materna e do bebê. Mulheres que não ganham peso suficiente durante a gestação apresentam risco de ter bebês prematuros ou com baixo peso, que por sua vez é um fator para mortalidade neonatal (GUAN et al., 2019; ZHAO et al., 2018). Um estudo de base populacional com mulheres gestantes conduzido nos EUA reportou que o GPG abaixo do recomendado esteve associado a maiores taxas de óbito materno e com morbidade neonatal grave independentemente do IMC pré-gestacional (VIVIAN UKAH et al., 2019).

O GPG excessivo também foi relacionado com desfechos como hipertensão, DMG e peso ao nascer grande para a idade gestacional (GIG), conforme mostram os estudos a seguir. Dude e colaboradores (2021) observaram que, em uma coorte com 8.628 gestantes, o GPG acima do recomendado foi associado a maiores chances de desordens hipertensivas, parto cesáreo e recém-nascido GIG. Corroborando com esses achados, uma coorte chinesa realizada com 3.172 gestantes demonstrou que o GPG excessivo aumentou o risco de DMG,

macrossomia fetal e de recém-nascidos grande para idade gestacional (SUN et al., 2020). Outro estudo, realizado com 1.215 gestantes hispânicas residentes nos EUA, mostrou que gestantes com GPG excessivo apresentaram maiores chances de parto cesáreo quando comparadas àquelas com GPG dentro da faixa recomendada pela IOM (HARVEY et al., 2018). Outras pesquisas reportaram ainda associação entre excessivo GPG e retenção de peso pós-parto, que é um forte preditor de obesidade futura (ASHLEY-MARTIN; WOOLCOTT, 2014; WIDEN et al., 2015).

Apesar das fortes evidências e das recomendações, verifica-se alta prevalência mundial de excessivo GPG. Um estudo de base populacional, conduzido no Canadá com 9.300 gestantes, identificou que 32% das mulheres apresentaram GPG excessivo (BENHAM et al., 2021). Entre mulheres hispânicas residentes nos EUA (n=1.215), 52% ganharam peso acima do recomendado (HARVEY et al., 2018). Dados publicados referentes a uma coorte com 8.628 gestantes americanas mostraram que 46,6% das gestantes participantes apresentaram GPG excessivo (DUDE et al., 2021). No Brasil, alguns pesquisadores encontraram prevalência de ganho excessivo de peso na gestação superior a 30%, chegando a 42,5% em estudos conduzidos na região Nordeste (FLORES et al., 2020; MAGALHÃES et al., 2015; MONTESCHIO et al., 2021).

Em geral, o aumento da demanda energética observado nessa fase é atendido a partir do aumento do consumo alimentar materno. No entanto, escolhas alimentares inadequadas podem contribuir para uma ingestão calórica acima da demanda e, consequentemente, para o GPG exagerado. Sendo assim, o período perinatal deve ser considerado uma oportunidade para aconselhamento e intervenções no estilo de vida materno visando reduzir a prevalência de desfechos adversos da gestação (G. CLIFTON et al., 2016).

2.4. Diabetes Mellitus Gestacional (DMG)

O DMG é a complicação metabólica mais comum da gestação e vem aumentando paralelamente com a epidemia global da obesidade, sendo que os fatores de risco incluem idade materna, sobrepeso e obesidade, GPG excessivo e histórico familiar de diabetes (ADA, 2021). A Sociedade Brasileira de Diabetes adota como critério para caracterização da DMG a alteração glicêmica reconhecida durante a gestação, com níveis glicêmicos sanguíneos que não atingem os critérios diagnósticos para Diabetes Mellitus. Portanto, valores de glicemia em jejum entre 92 e 126mg/dL são diagnósticos de DMG em qualquer fase da gestação (SBD, 2019).

Entre as adaptações metabólicas da gestação está o desenvolvimento da resistência à insulina, principalmente durante o segundo e o terceiro trimestre. Desse modo, geralmente, o DMG é desenvolvido quando as células beta-pancreáticas maternas secretam insuficiente quantidade de insulina para compensar essa resistência à insulina adequadamente, favorecendo o quadro de hiperglicemia. Normalmente essa condição é resolvida após o parto, porém, em muitos casos, esse defeito da célula beta pode evoluir conferindo alto risco de diabetes subsequente à gestação (BELLAMY et al., 2009; METZGER; BUCHANAN, 2018).

A Federação Internacional de Diabetes estima que 16,7% das mães de bebês nascidos vivos apresentam algum grau de hiperglicemia (IDF, 2021). Metanálise com 40 estudos encontrou uma prevalência de 5,4% na Europa (EADES; CAMERON; EVANS, 2017). Nos EUA, pesquisa com amostra representativa indicou que 7,6% das gestantes incluídas apresentaram GDM, sendo que destas, 19,7% desenvolveram diabetes subsequente à gestação (CASAGRANDE; LINDER; COWIE, 2018). Maior incidência foi observada na China, onde, em uma coorte de mulheres gestantes, 17% desenvolveram a doença (LI et al., 2020). Estima-se que, no Brasil, a prevalência no Sistema Único de Saúde seja de aproximadamente 7,6% (NEGRATO et al., 2010).

A hiperglicemia no período gravídico constitui relevante problema de saúde, uma vez que está associada e desfechos perinatais adversos e ao desenvolvimento de doenças futuras. O estudo *Hiperglycemia and Adverse Pregnany Outcomes* (HAPO) incluiu 25.000 gestantes de diversos países e concluiu que houve forte associação entre os níveis glicêmicos da gestante e a frequência de desfechos perinatais. Os riscos incluem parto cesáreo, nascimento prematuro, pré-eclâmpsia, maior peso ao nascer, distócia de ombros, admissão em unidade de cuidado neonatal intensivo, hipoglicemia neonatal e aumento da bilirrubina (HAPO STUDY COOPERATIVE RESEARCH GROUP, et al., 2008).

2.5. Desordens Hipertensivas Específicas da Gestação (DHEG)

Entre as complicações mais frequentes da gestação, as desordens hipertensivas são a principal causa de mortalidade perinatal e morbidade fetal no mundo (KASSEBAUM et al., 2016). Elas afetam entre 5 e 15% das mulheres e estão associadas ao surgimento de complicações maternas e fetais, sendo o parto prematuro a intercorrência mais frequente. As gestantes afetadas apresentam maior risco de doenças cardiovasculares ao longo da vida, independentemente de outros fatores de risco prévios (GAROVIC et al., 2022; TENG et al., 2021).

A hipertensão na gestação é definida por uma elevação da Pressão Arterial (PA) maior ou igual a 140/90mmHg em duas medições com intervalo de 4 horas, após a vigésima semana de gestação em mulheres previamente normotensas. A elevação da PA associada a proteinúria ou trombocitopenia, insuficiência renal, comprometimento da função hepática, edema pulmonar ou sintomas neurológicos e visuais caracteriza o quadro de pré-eclâmpsia (ACOG, 2020).

As causas e a fisiopatologia das DHEG ainda não estão bem esclarecidas, tendo em vista que a PA no período gestacional é muito dinâmica. Evidências sugerem que, em gestantes saudáveis, a PA tende a reduzir no primeiro trimestre atingindo o menor valor em torno da vigésima semana, e após há um aumento gradual até o parto. A ausência dessa queda de PA no meio do trimestre pode indicar a possibilidade de uma DHEG (TENG et al., 2021).

No Brasil, estudo de base populacional que incluiu 4892 gestantes, identificou hipertensão arterial em 7,5% das gestantes, sendo que destas 2,3% evoluíram para PE (GAIO et al., 2001). Estudo mais recente, conduzido em Belo Horizonte, incluiu 36.724 gestantes e observou prevalência de HA em 12,16% das gestantes estudadas (RAMOS FILHO; ANTUNES, 2020). Ademais, outro estudo, com dados do *Global Burden of Disease Study,* observou que, na maioria dos estados brasileiros, as DHEG figuram como a principal causa de mortalidade materna, variando de 13,4 a 55,1 óbitos por 100.000 nascidos vivos na Paraíba e Pernambuco, respectivamente (LEAL et al., 2022).

Alguns fatores de risco estão associados ao desenvolvimento de DHEG, tais como gestação gemelar, primiparidade, hipertensão crônica, DMG, obesidade materna, trombofilia, doença renal e idade materna acima de 35 anos. Além disso, hábitos de vida antes e durante a gestação podem influenciar na gravidade do desfecho (RANA et al., 2019).

A literatura tem mostrado benefícios da alimentação saudável na redução de chances de ocorrência de DHEG. Dois estudo conduzidos no Iran mostraram que gestantes com padrão alimentar saudável apresentavam menor risco para desenvolver pré-eclâmpsia (ZAREEI et al., 2019; HAJIANFAR et al., 2018). Além disso, estudo conduzido com 812 gestantes mostrou que alta chances de pré-eclâmpsia foi observada entre mulheres com maior adesão ao padrão dietético ocidental, caracterizado por alimentos refinados e UTP (HAJIANFAR et al., 2018).

2.6. Peso ao nascer

O peso ao nascer é um parâmetro importante para avaliar as condições de saúde do recém-nascido e está incluído entre os 100 indicadores básicos na lista de referência global da

Organização Mundial de Saúde (OMS). A proporção de crianças com baixo peso ao nascer em uma população constitui um indicador de saúde pública, pois, reflete as condições nutricionais, de saúde e socioeconômicas materna, bem como a qualidade da atenção pré-natal prestada (WHO, 2022).

De acordo com a OMS o baixo peso ao nascer (BPN) é caracterizado pelo peso ao nascer menor que 2500g independentemente da idade gestacional. Estima-se que 15 a 20% dos nascimentos no mundo são baixo peso, o que representa mais de 20 milhões de nascimento por ano (WHO, 2014). No Brasil, coorte nacional conduzida entre 2011 e 2018 estimou prevalência de BPN correspondente a 9,6% dos nascimentos vivos (PAIXAO et al., 2021).

Desordens hipertensivas da gestação, prematuridade, histórico de aborto, etnia, educação materna e baixa adesão ao acompanhamento pré-natal são alguns fatores de risco para a ocorrência de BPN (BAYE MULU et al., 2020; FALCÃO et al., 2020). As consequências do nascimento com baixo peso incluem maiores taxas de mortalidade e morbidade fetal e neonatal, comprometimento do desenvolvimento cognitivo e risco aumentado de doenças crônicas na vida adulta, como hipertensão e diabetes. Adicionalmente, é considerado o fator isolado mais influente na sobrevivência nos primeiros anos de vida (TCHAMO; PRISTA; LEANDRO, 2016).

Por outro lado, o peso excessivo ao nascer é caracterizado pelo peso ao nascer maior que 4000g a 4500g independentemente da idade gestacional ou ainda quando, durante a gestação, o peso fetal está acima do percentil 90 para a idade gestacional (KINTANAR, 2020).

Há uma grande variação na prevalência dessa condição no mundo, variando de 0,5% na Índia a 14,5% na Algéria (KOYANAGI et al., 2013). Nos Estados Unidos, estudo longitudinal com 12.561 gestantes indicou taxa de 13,2% de nascimentos com excesso de peso (BAUGH et al., 2016). No Brasil foi encontrada prevalência de macrossomia de 5,3% entre 2001 e 2010 e de 5,1% entre 2012 e 2014, sendo mais prevalentes nas regiões Norte e Nordeste (NASCIMENTO et al., 2017).

Entre os determinantes para o excesso de peso ao nascer destacam-se o GPG excessivo, DMG, idade e obesidade materna, e ainda o sexo fetal masculino (CZARNOBAY et al., 2019; FANG et al., 2019). O recém-nascido GIG apresenta maior risco de asfixia neonatal, hipoglicemia fetal, traumas esqueléticos (como a distócia de ombros), hemorragia pós-parto e maior chance de parto cesáreo e prematuridade. Ademais, os efeitos tardios incluem o desenvolvimento de doenças crônicas não transmissíveis na vida adulta, como diabetes, obesidade, dislipidemia e hipertensão (SAID; MANJI, 2016; TURKMEN; JOHANSSON; DAHMOUN, 2018).

2.7. Nascimento prematuro

O nascimento prematuro é caracterizado pelo parto antes de 37 semanas completas ou com menos de 259 dias de gestação a contar do último período menstrual materno. Estima-se que, mundialmente, 15 milhões de crianças nascem prematuras a cada ano, sendo este um número crescente. Destes, mais de um milhão morrem logo após o nascimento, e outros apresentam comprometimento no desenvolvimento físico ou neurológico (LIU et al., 2016).

A prematuridade é um problema de saúde global. Embora muito prevalente em países de baixa renda, com maiores índices na África e na Ásia, os números alarmantes não se limitam a essas regiões. Os EUA e o Brasil figuram entre os 10 países com maior número de nascimentos prematuros sendo que nos EUA esse índice chega a 12% dos nascimentos (BLENCOWE et al., 2012). No Brasil a prematuridade variou entre 10,87% e 9,95% entre 2012 e 2019, com menor proporção no período de 9,77% em 2015 (MARTINELLI et al., 2021).

Complicações relacionadas ao nascimento prematuro lideram as causas de mortalidade em crianças menores de cinco anos no mundo, sendo responsável por 35% dos óbitos neonatais (HUG et al., 2019). As consequências incluem maior risco de síndromes respiratórias, complicações neurológicas, dificuldade de amamentação, maior índice de hospitalização e, ainda, dificuldades de comportamento e de aprendizagem na infância (DE ARAÚJO et al., 2012; MOREIRA; MAGALHÃES; ALVES, 2014).

A etiologia da prematuridade ainda não está bem esclarecida e grande parte dos casos não apresentam determinantes evidentes. No entanto, diversos estudos reportam fatores de risco associados ao nascimento pré-termo, tais como idade materna, histórico de parto prematuro, sexo fetal masculino, pré-eclâmpsia, DMG, doenças infecciosas na gestação, anemia e depleção nutricional materna (FERRERO et al., 2016; WAGURA et al., 2018; WALDENSTRÖM et al., 2014). Adicionalmente, pesquisadores tem observado associação da qualidade da dieta da gestante com a prematuridade. Maiores chances de nascimento pré-termo foram observadas em gestantes com alto consumo de alimentos processados e ricos em gordura e açúcar ao passo que o consumo de uma dieta saudável, rica em frutas, vegetais e cereais integrais, parece reduzir o risco significativamente (GRIEGER; GRZESKOWIAK; CLIFTON, 2014; MARTIN; SOTRES-ALVAREZ; SIEGA-RIZ, 2015; RASMUSSEN et al., 2014).

Por fim, a literatura tem demonstrado que a alimentação adequada é fundamental para a prevenção de desfechos perinatais negativos. O monitoramento do padrão alimentar de

gestantes tem sido reconhecido como uma estratégia prioritária para a promoção e a proteção da saúde materno-infantil (WHO, 2016) .

2.8. Consumo de nutrientes, alimentos UTPs e qualidade nutricional da dieta

Durante o desenvolvimento intrauterino, existem períodos críticos nos quais um sistema ou órgão deve amadurecer. Nesta fase, os nutrientes desempenham papel importante na programação da fisiopatologia fetal e pós-natal, e o estado nutricional gestacional inadequado pode afetar negativamente processos de desenvolvimento do feto (DE BOO; HARDING, 2006).

Nutrientes essenciais, como zinco, folato e vitaminas do complexo B, estão envolvidos no metabolismo de um carbono, necessário para a proliferação celular, crescimento e síntese de proteínas nos estágios iniciais da gestação. A ingestão inadequada desses nutrientes pode levar a desfechos adversos, incluindo pré-eclâmpsia, parto prematuro, diabetes mellitus gestacional, restrição de crescimento intrauterino, peso adverso ao nascer, natimorto, mortalidade perinatal, neonatal e materna (BIRHANIE et al., 2020).

Estudo realizado com dados 8259 gestantes nulíparas e com gestação única da coorte "Mother-To-Be" mostrou que a adesão a uma dieta de baixa qualidade nutricional esteve associada a maior risco de parto cirúrgico, desordens hipertensivas, hemorragia pós-parto, admissão do neonato em unidade de cuidado intensivo, nascimento prematuro e baixo peso (YEE et al., 2020). Outro estudo, com 7553 gestantes da Tanzânia, encontrou associação inversa entre maior qualidade da dieta e nascimento prematuro, baixo peso ao nascer, e aborto (MADZORERA et al., 2020).

O alto consumo de dietas ricas em alimentos UTPs pode afetar negativamente a qualidade nutricional da dieta, tanto pela ingestão excessiva de alimentos considerados não saudáveis, como pela substituição da ingestão de alimentos naturais, como frutas, grãos integrais e hortaliças, que são fontes de fibras, vitaminas e minerais (DICKEN; BATTERHAM, 2021).

Na população adulta em geral, evidências mostram que o alto consumo de UTPs afeta negativamente a qualidade nutricional da dieta, pois, estão associados ao aumento de açúcares livres, gorduras totais e gorduras saturadas, bem como, à diminuição de nutrientes como fibras, proteínas, potássio, zinco, magnésio e vitaminas A, C, D, E, B12 e B3 na dieta (LOUZADA et al., 2015; MARTÍNEZ STEELE et al., 2017; MARTINI et al., 2021).

De forma semelhante, durante a gestação, o consumo prevalente destes alimentos está associado a múltiplos aspectos negativos da qualidade da dieta materna. Estudo de coorte

conduzido com gestantes americanas mostrou que as participantes que consumiram menos de 40% de energia a partir de alimentos UTPs consumiram quase duas vezes mais hortaliças, três vezes mais feijões, duas a três vezes mais frutas em comparação com aqueles que consumiram ≥60% da ingestão de energia de alimentos UTPs. Por outro lado, aquelas com maior consumo de alimentos UTPs consumiram aproximadamente 1,5 vezes mais grãos refinados e mais que o dobro de açúcar (NANSEL et al., 2022).

Neste sentido, um estudo transversal conduzido com 295 gestantes do nordeste do Brasil encontrou que o aumento da presença de alimentos UTPs na dieta implicou em redução estatisticamente significativa da ingestão de proteínas, fibras, magnésio, ferro, potássio, zinco, selênio, folato e vitaminas D e E (GRACILIANO; SILVEIRA; OLIVEIRA, 2021).

As necessidades nutricionais e de micronutrientes aumentam substancialmente durante a gestação para atender as demandas do desenvolvimento fetal. No entanto, mesmo nos casos em que a dieta adequada está acessível, há alta prevalência de consumo inadequado de micronutrientes nesta população, com ingestão frequentemente abaixo do ideal, particularmente de ferro, iodo, folato, vitamina D, vitamina B12. Este fator está associado principalmente a mudanças no padrão alimentar, com maior consumo de dietas consideradas com baixa qualidade nutricional, ou seja, ricas em alimentos não saudáveis, e com alta adição de sal e açúcar (PARISI; LAORETI; CETIN, 2014).

Esses achados demonstram que a qualidade da dieta durante a gestação é um importante fator de risco modificável para desfechos perinatais adversos, evidenciando a necessidade de investigar melhor o consumo de nutrientes e o grau de processamento dos alimentos consumidos nesta população de acordo com a classificação NOVA.

3. Objetivos

3.1. Objetivo geral

Investigar o efeito do consumo de dietas ricas em alimentos UTP por gestantes sobre desfechos perinatais adversos, e seu impacto sobre a composição nutricional da dieta.

3.2. Objetivos específicos

- Revisar a associação do consumo de alimentos UTP durante a gestação e desfechos maternos e neonatais adversos (ganho de peso gestacional, desordens hipertensivas da gestação, diabetes gestacional, peso ao nascer e prematuridade).

- Analisar o impacto do consumo de alimentos UTP sobre a composição nutricional da dieta de gestantes atendidas nas UBS do DF.

4. Métodos

4.1. Artigo 1. Revisão Sistemática

Título: ***"Maternal consumption of ultra-processed foods-rich diet and perinatal outcomes: a systematic review and meta-analysis"***

4.1.1. Tipo de estudo

A presente revisão sistemática com metanálise foi conduzida conforme recomendações do protocolo PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-analysis*) e seu protocolo foi registrado na plataforma PROSPERO (*Prospective Register of Systematic Reviews*) sob o código CRD42021257210.

4.1.2. Critérios de inclusão

Para a definição dos artigos elegíveis para a revisão (tabela 1), foram considerados os seguintes critérios:

-Estudos com gestantes adultas saudáveis de todos os trimestres gestacionais;

-Estudos observacionais do tipo transversal, coorte prospectiva e retrospectiva e caso-controle;

-Estudos que apresentam dados de associação entre o consumo materno de pelo menos um alimento da categoria ultraprocessados, conforme classificação NOVA, e desfechos perinatais.

Tabela 1 – Descrição da estratégia PECOS

Parâmetro	**Critério**
P (População)	Gestantes de todos os trimestres gestacionais
E (Exposição)	Consumo de alimentos não saudáveis e dietas ricas em ultraprocessados
C (Comparação)	-
O (*Outcomes*/desfechos)	Desfechos maternos (Ganho de peso gestacional, desordens hipertensivas da gestação, diabetes gestacional) e neonatais (peso ao nascer, prematuridade)
S (*Study design*/tipo de estudo)	Estudos observacionais (transversal, coorte e caso-controle)

4.1.3. Critérios de exclusão

Foram excluídos desta revisão:

- Estudos realizados exclusivamente com gestantes adolescentes;

-Estudos que avaliam a qualidade da dieta utilizando *scores* de índices de qualidade da dieta;

-Estudos que avaliam gestantes com comorbidades prévias à gestação;

-Estudos com desfechos avaliados após 1 ano do nascimento;

-Estudos com animais, resumo de congresso, cartas aos editores, resenhas, opiniões pessoais, capítulos de livros, comentários, editoriais, revisões e qualquer publicação sem dados primários.

4.1.4. Fontes de informações e estratégias de busca

As seguintes bases de dados foram utilizadas na realização da busca: *MEDLINE, Scopus, Embase, LILACS (via BVS), Web of Science, ProQuest Dissertations & Theses Global e Google Scholar*, sendo as duas últimas consideradas literatura cinzenta. A estratégia de busca foi validada por um pesquisador experiente em revisões sistemáticas e com experiência de atuação na área, por meio da ferramenta de *check list Peer Review of Electronic Search Strategies* (PRESS) (MCGOWAN et al., 2016) (Apêndice 1). Publicações até a data de 10 de junho de 2021 foram analisadas e as buscas foram atualizadas na data de 31 de maio de 2022.

A estratégia de busca utilizada e adaptada para bases de dados foi construída a partir dos seguintes descritores e operadores booleanos: pregnancy OR pregnancies OR gestation OR pregnant women OR pregnant woman OR maternal OR antenatal AND ultraprocessed food OR ultra-processed food OR industrialized food OR processed food OR ready-to-eat meal OR ready-to-eat food OR ready-prepared food OR salty food OR high-fat diet OR highly processed foods OR refined food OR fast food OR junk food OR sugar-sweetened beverages OR soft drink OR unhealthy eating OR unhealthy diet OR poor diet OR processed meat AND perinatal outcome OR pregnancy outcome OR pregnancy complications OR gestational weight gain OR pregnancy weight gain OR birth outcomes OR birth weight OR neonatal weight OR newborn weight OR birth size OR pregnancy-induced hypertension OR hypertensive disorders OR gestational diabetes OR glycemic outcomes OR premature birth OR preterm birth OR fetal growth.

A busca realizada no Google Scholar se limitou aos primeiros 200 artigos. Não houve restrição de idioma ou data de publicação em nenhuma das bases. As estratégias de busca utilizadas para cada base estão disponíveis no Apêndice 2.

4.1.5. Seleção dos estudos e extração dos dados

O processo de seleção dos estudos foi conduzido de forma independente, por duas pesquisadoras, sendo as discordâncias solucionadas por consenso. Todos os artigos selecionados nas bases de dados foram importados para o gerenciador de referências bibliográficas Mendeley, com posterior remoção das duplicatas. Na etapa seguinte, leitura independente de títulos e resumos, foi utilizado o aplicativo da web para revisões sistemáticas Rayyan (OUZZANI et al., 2016). Posteriormente, foi realizada a leitura completa dos artigos selecionados na etapa anterior.

Após a seleção dos estudos, os seguintes dados foram extraídos, com o apoio de uma planilha no programa Microsoft Excel 365® (versão 16.65): título do estudo, autores, país e ano de publicação, ano de coleta dos dados, desenho do estudo, tamanho da amostra, faixa etária e idade gestacional, exposição estudada, método de avaliação da exposição, desfecho, medida de avaliação do desfecho, medida de associação entre exposição e desfecho com intervalo de confiança, fatores de ajuste e fontes de financiamento/suporte do estudo. Para minimizar a possibilidade de erros durante o processo de extração, uma pesquisadora extraiu os dados e a outra fez a verificação dos dados coletados. Dados faltantes ou informações adicionais foram solicitados aos autores do artigo, com pelo menos duas tentativas de contato.

4.1.6. Avaliação do risco de viés

O processo de avaliação do risco de viés foi conduzido de forma independente, por duas pesquisadoras, sendo as discordâncias solucionadas por consenso. Para condução da análise do risco de viés foram utilizados os instrumentos de avaliação crítica elaborados pelo Instituto Joanna Briggs (JBI), de acordo com o tipo de estudo: coorte, transversal e caso-controle. O instrumento consiste em um *check list,* onde cada item deve ser respondido com: sim, não, não está claro e não se aplica. Nele são avaliados os aspectos de delineamento do estudo, adequação da amostra e dos grupos de comparação, mensuração dos resultados, período de acompanhamento e análise estatística apropriada. A avaliação abrange 11 domínios para estudos de coorte, 10 para estudos do tipo caso-controle e 8 para estudos transversais. Foram considerados com risco de viés baixo os estudos que apresentaram "sim" como resposta para todos os itens. Aqueles que apresentaram "não" ou "não está claro" como resposta para algum item, foram considerados com alto risco de viés. A avaliação do risco de viés não foi utilizada como critério de exclusão dos artigos, sendo parâmetro para estudo da heterogeneidade. Ademais, não foram atribuídas pontuações e os dados foram apresentados por meio da análise da frequência relativa de cada domínio investigado.

4.1.7. Análise dos dados

Os desfechos maternos incluídos na análise quantitativa foram: ganho de peso gestacional, diabetes gestacional, desordens hipertensivas específicas da gestação (hipertensão e pré-eclâmpsia); enquanto os desfechos neonatais foram: peso ao nascer (baixo peso ao nascer e grande para a idade gestacional) e prematuridade. Na fase qualitativa foram identificadas as principais características e os principais resultados relacionados aos desfechos. A análise quantitativa incluiu somente os estudos de coorte visando reduzir a heterogeneidade da análise.

Os dados foram coletados em planilha eletrônica do programa Microsoft Excel 365® (versão 16.65), e as análises dos dados realizadas no pacote estatístico STATA® versão 15 (StataCorp LLC, College Station, TX, EUA), número de série: 301506206729.

Metanálise e análise de heterogeneidade

A metanálise foi conduzida quando 3 ou mais estudos apresentaram o mesmo desfecho, sendo calculada a partir do modelo de efeitos aleatórios e ponderada pelo inverso da variância, conforme método proposto por DerSimonian–Laird (1986).

Os desfechos foram analisados baseados na disponibilidade de uma medida de associação e intervalo de confiança de 95% (IC 95%). O valor de OR (*Odds Ratio)* foi utilizado como a medida de estimativa de efeito, sendo que quando disponível o valor de RR (Risco Relativo) este foi convertido em OR (ZHANG; YU, 1998). Os estudos que não reportaram OR ou RR, mas apresentaram o coeficiente (β) foram analisados separadamente.

A variação entre os estudos (heterogeneidade) foi avaliada pelo teste do qui-quadrado, sendo sua magnitude verificada pelo o i-quadrado (I^2), que descreve a porcentagem de variabilidade nas estimativas de efeito que se devem à heterogeneidade. Visualmente, a heterogeneidade pode ser observada por meio do gráfico *forest plot,* construído a partir da estimativa de associação de cada estudo e do intervalo de confiança (95%). Para valores de I^2 menores que 40%, a heterogeneidade não foi considerada importante (DEEKS; HIGGINS; ALTMAN, 2022).

4.2. Artigo 2. Estudo Original

Título: ***Impact of ultra-processed food consumption on quality of diet in Brazilian pregnant women assisted in Primary Health Care***

4.2.1. Delineamento do estudo, local e amostragem

Trata-se de um estudo observacional transversal analítico derivado do Estudo Multicêntrico sobre Deficiência de Iodo (EMDI-Brasil) no Distrito Federal (DF). A população foi composta por gestantes do primeiro, segundo e terceiro trimestres gestacionais que estavam em acompanhamento pré-natal na Atenção Primária à Saúde (APS) no Sistema Único de Saúde. No DF, foram selecionadas 10 Unidades Básicas de Saúde (UBS) de acordo com a probabilidade proporcional à proximidade da região central e à média mensal de atendimentos de pré-natal realizados no ano de 2016 (dado informado pela Secretaria de Estado da Saúde do DF). As UBS selecionadas abrangeram as regiões Norte (UBS 4 Planaltina e UBS 1 Sobradinho), Centro Norte/Sul (UBS 1 e UBS 2 Guará), Sul (UBS 1 Candangolândia), Leste (UBS 1 Paranoá), Sudeste (UBS 4 Samambaia) e Oeste (UBS 7, UBS 9 e UBS 10 Ceilândia).

Um cálculo amostral aleatório simples foi realizado usando a ferramenta StatCalc do software EpiInfo (Center for Disease Control and Prevention, EUA). O cálculo do tamanho amostral levou em consideração o número médio mensal de atendimentos de consultas pré-natal em UBS no ano de 2016 como proxy do número de gestantes acompanhadas pela APS no DF (n= 18.877; dado informado pela Secretaria de Estado da Saúde do DF); e a prevalência do

indicador “consumo de alimentos ultraprocessados no dia anterior” do Sistema de Vigilância Alimentar e Nutricional (SISVAN), no mesmo ano, entre as gestantes brasileiras acompanhadas pela APS (81,5%) (BRASIL, 2016). Foi considerado aceitável o erro de 5% e o nível de confiança de 95%. Desse modo, o número mínimo de gestantes a serem avaliadas foi definido em 190 participantes. Acrescentou-se 20% ao número estimado, antecipando possíveis perdas, assim a amostra mínima foi estimada em 228 gestantes.

4.2.2. Critérios de inclusão e exclusão

Foram incluídas neste estudo as gestantes de todos os trimestres gestacionais (primeiro, segundo e terceiro trimestres), usuárias da rede pública de saúde do DF atendidas nas UBS selecionadas. Foram excluídas as gestantes com histórico de doença ou cirurgia tireoidiana, diagnóstico referido de hipotireoidismo ou hipertireoidismo, devido às possíveis interferências com os desfechos investigados pelo EMDI-Brasil.

4.2.3. Coleta de dados

A coleta de dados foi realizada nas UBS selecionadas, onde as gestantes foram abordadas e convidadas a participar do estudo enquanto aguardavam ou após a consulta pré-natal. A coleta de dados foi conduzida entre agosto de 2019 a setembro de 2021. Especificamente durante o período de novembro de 2020 a abril de 2021, devido às restrições impostas pela pandemia do COVID-19, a coleta de dados socioeconômicos foi realizada via telefone, com posterior agendamento individual presencial com a gestante para a aplicação presencial do questionário de consumo alimentar. Os dados foram coletados por entrevistadores previamente treinados a partir da aplicação de questionários semiestruturados. A participação foi condicionada a assinatura do Termo de Consentimento livre e Esclarecido – TCLE (Apêndice 4).

Dados socioeconômicos, demográficos e de saúde

Informações socioeconômicas, demográficas, ambientais e de saúde das gestantes foram coletados por meio de questionário composto pelos seguintes blocos: elegibilidade, dados da gestação (histórico obstétrico, morbidades e acesso aos serviços de saúde), consumo de sal de cozinha, hábitos de fumo e álcool e dados socioeconômicos (idade, raça/cor, nível de instrução, ocupação no mercado de trabalho, composição e renda familiar) (Apêndice 5).

Estado Nutricional

Os dados referentes a peso pré-gestacional (PPG), data da última menstruação (DUM), peso atual, idade, e estatura foram coletados da Caderneta da Gestante. Os valores de IMC pré-gestacional foram categorizados de acordo com os critérios da OMS (<18,5 baixo peso, ≥18,5–24,9 peso adequado, ≥25,0-29,9 sobrepeso e ≥30,0 obesidade) (WHO, 2000).

O ganho de peso gestacional foi classificado segundo proposto por Kac et al. (2021) para mulheres brasileiras a partir de 10 semanas de gestação, sendo que aquelas com idade gestacional inferior a 10 semanas não foram consideradas para avaliação do GPG (n=13). Para este estudo considerou-se abaixo do esperado GPG < percentil 25; de acordo com o esperado GPG entre percentil 25 e percentil 75; e acima do esperado – ou excessivo – o percentil de GPG > 75 (KAC et al., 2021).

Consumo Alimentar

O consumo alimentar foi analisado por meio da aplicação de dois recordatórios alimentares de 24 horas, coletador em em dias não consecutivos, com o objetivo de investigar o consumo alimentar com foco no nível de processamento dos alimentos (Apêndice 6). A aplicação de segundo recordatório alimentar foi realizada em 20% da amostra.

A entrevista foi conduzida de acordo com o método de múltiplos passos do Departamento de Agricultura dos Estados Unidos *(*USDA *5-step multiple-pass method*), que consiste em 5 passos para a coleta dos dados: (1) listagem rápida inicial de alimentos e bebidas consumidas; (2) listagem de alimentos comumente esquecidos; (3) investigação sobre horário e ocasião das refeições; (4) detalhamento das informações prévias incluindo descrição sobre quantidade, modo de preparo, adições e marcas; e (5) revisão final das informações do recordatório (CONWAY et al., 2003). Durante a entrevista foi utilizado o Manual Fotográfico de Quantificação Alimentar para auxiliar na identificação das porções consumidas. O álbum contém fotos de espessuras e volumes das medidas caseiras, formas e porções de alimentos e alimentos em unidades padrões (CRISPIM, 2017).

Os dados de consumo alimentar coletados foram convertidos de medidas caseiras para gramas e mililitros e posteriormente analisados pela composição centesimal de nutrientes por meio do software *Globodiet* versão *Data Entry,* desenvolvido pela *GloboDiet Initiative,* que criou e adaptou um método padronizado e informatizado para coleta de dados através do Recordatório 24 horas (BEL-SERRAT et al., 2017).

A análise do consumo alimentar incluiu a avaliação da ingestão energética total, ingestão de macronutrientes e micronutrientes. A densidade nutricional de cada micronutriente

da dieta foi expressa em mg ou mcg por 1.000 kcal enquanto os macronutrientes foram expressos em porcentagem de ingestão energética. O consumo de alimentos foi categorizado de acordo com o grau de processamento definido pela classificação NOVA: *in natura* ou minimamente processados, ingredientes culinários, processados e UTPs (MONTEIRO et al., 2016). A variável de exposição de interesse neste estudo foi a ingestão de UTPs. Os percentuais de ingestão energética relativa aos UTPs foram distribuídos em quintis de acordo com a contribuição destes alimentos para o valor calórico total da dieta (% kcal). O primeiro quintil foi classificado como o menor percentual de consumo e o quinto como o maior percentual de consumo. O uso de suplementos de micronutrientes não foi considerado na análise dietética.

4.2.4. Análise dos dados

Os resultados descritivos foram expressos em média e desvio padrão (DP) para variáveis contínuas. Para calcular a frequência relacionada às variáveis categóricas, estimou-se a prevalência com seus respectivos Intervalos de Confiança (IC 95%).

A contribuição calórica média de todos os grupos de alimentos, de acordo com a classificação NOVA, para a ingestão diária total de energia foi estimada. As gestantes foram estratificadas em cinco grupos de acordo com os quintis de consumo energético médio de UTPs. A associação entre os quintis de energia de UTP e a ingestão total de energia e nutrientes foi analisada pelo modelo de regressão linear multivariável. O primeiro quintil foi considerado a categoria de referência para todas as análises de regressão. Todas as análises foram ajustadas para idade, anos de estudo, trimestre gestacional, participação em programa governamental de assistência social e situação de trabalho. Os coeficientes de regressão foram apresentados com seus respectivos IC 95%. Foi considerado um nível de significância de 5%. As análises estatísticas foram realizadas no software Stata (StataCorp. 2019. Stata Statistical Software: Release 16.1. College Station, TX, EUA: StataCorp LLC).

4.2.5. Aspectos éticos

O presente estudo foi aprovado pelo Comitê de Ética em Pesquisa da Faculdade de Ciências da Saúde da Universidade de Brasília (UNB-DF), sob o número CAAE: 80172617.0.2008.0030 e parecer: 2.977.035 e pela Fundação de Ensino e Pesquisa em Ciências da Saúde (FEPECS), sob o número CAAE: 09940819.2.3001.5553 e parecer: 3.489.243. A coleta de dados foi realizada somente após a concordância da participante e assinatura do Termo de Consentimento Livre e Esclarecido (TCLE).

nutrients

MDPI

5. Resultados e Discussão

5.1. Artigo 1: Revisão Sistemática

Systematic Review

Maternal Consumption of Ultra-Processed Foods-Rich Diet and Perinatal Outcomes: A Systematic Review and Meta-Analysis

Walkyria O. Paula [1], Erika S. O. Patriota [1], Vivian S. S. Gonçalves [2] and Nathalia Pizato [1,*]

[1] Graduate Program in Human Nutrition, Faculty of Health Sciences, University of Brasilia, 70910-900 Brasilia, Brazil; walkyria.paula@hotmail.com (W.O.P.); erikapatriota.nut@gmail.com (E.S.O.P.)
[2] Graduate Program in Public Health, Faculty of Health Sciences, University of Brasilia, 70910-900 Brasilia, Brazil; vivian.goncalves@unb.br
* Correspondence: pizatonat@unb.br

Abstract: The consumption of ultra-processed food (UPF)-rich diets represents a potential threat to human health. Considering maternal diet adequacy during pregnancy is a major determinant for perinatal health outcomes, this study aimed to systematically review and meta-analyze studies investigating the association between maternal consumption of a UPF-rich diet and perinatal outcomes. Conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines, five electronic databases and gray literature using Google Scholar and ProQuest Dissertations and Theses Global were searched up to 31 May 2022. No restrictions were applied on language and publication date. Two reviewers independently conducted the study selection and data extraction process. Meta-analysis was conducted according to the random-effects model. In total, 61 studies were included in the systematic review and the overall population comprised 698.803 women from all gestational trimesters. Meta-analysis of cohort studies showed that maternal consumption of UPF-rich diets was associated with an increased risk of gestational diabetes mellitus (odds ratio (OR): 1.48; 95% confidence interval (CI): 1.17, 1.87) and preeclampsia (OR: 1.28; 95% CI: 1.15, 1.42). Neonatal outcomes showed no association. The overall GRADE quality of the evidence for the associations was very low. The findings highlight the need to monitor and reduce UPF consumption, specifically during the gestational period, as a strategy to prevent adverse perinatal outcomes.

Keywords: maternal diet; NOVA classification; perinatal outcomes

Citation: Paula, W.O.; Patriota, E.S.O.; Gonçalves, V.S.S.; Pizato, N. Maternal Consumption of Ultra-Processed Foods-Rich Diet and Perinatal Outcomes: A Systematic Review and Meta-Analysis. *Nutrients* **2022**, *14*, 3242. https://doi.org/10.3390/nu14153242

Academic Editors: Bruce W. Hollis, Daniela Martini and Monica Dinu

Received: 2 July 2022
Accepted: 1 August 2022
Published: 8 august 2022

1. Introduction

Significant metabolic and physiological changes occur during pregnancy, to support fetal growth and development [1]. Maternal diet quality is a major determinant for perinatal outcomes including hypertensive disorders, gestational diabetes, low birth weight, large gestational age, and preterm birth [2]. Furthermore, inadequate diet quality during pregnancy is associated with chronic diseases in later life such as type 2 diabetes mellitus, obesity, hypertension, and cardiovascular disorders [3].

Additionally to the evidence of the relationship between maternal diet quality and perinatal outcomes, several studies have reported high consumption of unhealthy and ultra-processed foods (UPFs) by pregnant women indicating a generally worse quality of diet [4–7].

The NOVA food classification system has been applied worldwide to evaluate the impact of modern industrial food systems on human diet and health according to the nature, extent, and purpose of food processing [8]. NOVA categorizes foods according to the degree of processing: in natura or minimally processed, processed culinary ingredients, processed food, and UPFs. UPFs are defined as industrial formulations manufactured from processed substances extracted or refined from whole foods. They are typically energy-dense products, with high amounts of sugar, fat, and salt, and low in dietary fiber, protein, vitamins, and minerals. UPFs also include industrial ingredients, such as hydrogenated fat, protein isolates, and additives such as colors, flavors, artificial sweeteners, and emulsifiers [9]. Some examples include products such as fast foods, cereal bars, cakes, ice cream, pizza, sausages, and soft drinks [10].

UPF intake is considered a hallmark of the Western diet and other unhealthy eating patterns such as the Prudent diet, characterized by a high intake of energy-dense and processed food, and rich in industrialized food-like products that are typically made with low-quality ingredients and deliver little nutritional value [11]. UPFs have become increasingly prevalent in the food supply system globally since they are designed to be attractive, palatable, cheap, and convenient products [12]. They account for more than 50% of the energy intake in developed countries such as the USA [13] and the UK [14] and are widely prominent in the diets of populations in lower-middle-income countries [15,16]. A recent meta-analysis of nationally representative samples showed an inverse linear relation between UPFs and less-processed foods when considered in relation to other food groups. The study also indicated that the increase in UPF intake was correlated with an increase in nutrients such as free sugars, total fats, and saturated fats, as well as a decrease in fiber, protein, potassium, zinc, and magnesium, and vitamins A, C, D, E, B3 and B12 [17]. Considering that during pregnancy women need a higher amount of the majority of nutrients to achieve optimal fetal growth and birth weight, varied diets and increased nutrient intake are needed to cope with the extra demand. Associations between maternal UPF consumption and perinatal outcomes have been investigated during the past years, however the findings are limited and inconsistent. Some studies have reported a significant association between consumption of UPF-rich diets during pregnancy and excessive gestational weight gain (GWG) [4,18], higher gestational diabetes mellitus (GDM) risk [19], hypertensive disorders of pregnancy (HDP) such as preeclampsia [20], low birth weight (LBW) [21] and preterm birth [22], while others have shown no association [7,23].

Previous systematic reviews have explored the association between maternal dietary patterns and maternal or infant outcomes [24–26]. However, these studies did not consider the degree of food processing, which has become an important aspect of diet quality [10].

A recent systematic review [27] reported that the highest UPF consumption negatively impacts nutrition and disease development indicators in pregnant, lactating women and children. However, a meta-analysis of the results was not conducted, and no other dietary patterns characterized by high UPF consumption were explored during the pregnancy period.

Since the pregnancy period is considered a window of opportunity to improve dietary intake which is considered a modifiable risk factor [28], a better understanding of maternal UPF consumption effects on perinatal outcomes is crucial to promoting mother and infant health. Thus, this study aimed to determine the association between UPF-rich diet consumption by pregnant women and perinatal (maternal and neonatal) outcomes through a comprehensive systematic review with meta-analysis. The hypothesis was that a higher intake of UPF-rich diet during pregnancy is associated with adverse perinatal outcomes.

2. Materials and Methods

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement for reporting systematic reviews [29] and its protocol was registered on the International Prospective Register of Systematic Reviews (PROSPERO) under registry number CRD42021257210. The PECOS acronym (Population, Exposure, Comparison, Outcome, and Study design) was used to elaborate the guiding research question as follows: "Is consumption of a UPF-rich diet during pregnancy associated with adverse perinatal outcomes?" (Supplementary Materials Table S1).

2.1. Eligibility Criteria

This review included observational studies (cross-sectional, longitudinal, case-control) that reported a measure of association (relative risk, odds ratio, or β-coefficients with confidence interval) between UPF-rich diet consumption and perinatal outcomes. For this review, we considered it UPF-rich diet consumption when the evaluated food, diet, or dietary pattern included at least one food from the UPF group defined by the NOVA Food Classification System [9], such as fast foods, junk foods, processed meats, soft drinks, confectionaries, pizzas, hamburgers, candies and sweets, sweetened beverages and cookies. Diet patterns described as unhealthy dietary patterns compared to healthy patterns, and Western and Prudent diet patterns which are characterized by a higher intake of red and processed meats, beverages sweetened with sugar, sweets, desserts, industrialized food-like products, and refined grains with a high intake of energy-dense and processed foods, were also considered as a proxy for high UPF intake. No date of publication or language restriction was applied.

Studies including pregnant women with pre-existing diseases, animal studies, letters to editors, reviews, personal opinions, reviews, book chapters, editorials, congress abstracts, or any publication without primary data were excluded. Studies that evaluated individual nutrient or diet scores and studies without the required data being available even after at least two attempts to contact the authors by e-mail were also excluded.

2.2. Information Sources and Search Strategy

A systematic literature search was performed on 10 June 2021, and updated on 31 May 2022, using the following databases: Medline, Embase, Scopus, Web of Science, and Lilacs (BVS). Furthermore, a gray literature search was also performed using ProQuest Dissertations and Theses Global and Google Scholar (limited to the first 200 most relevant results). The reference lists of selected articles were hand-searched to identify additional relevant publications.

The search strategy was comprised of free text words and identified terms in Medical Subject Headings and Health Sciences Descriptors for participants, exposure, and outcomes. The following terms and words combinations were searched: (pregnancy OR pregnancies OR gestation OR "pregnant women" OR "pregnant woman" OR maternal OR antenatal) AND (ultraprocessed food OR "ultra-processed food" OR "industrialized food" OR "processed food" OR "ready-to-eat meal" OR "ready-to-eat food" OR "ready-prepared food" OR "salty food" OR "high-fat diet" OR "highly processed foods" OR "refined food" OR "fast food" OR "junk food" OR "sugar-sweetened beverages" OR "soft drink" OR "unhealthy eating" OR "unhealthy diet" OR "poor diet" OR "processed meat") AND ("perinatal outcome" OR "pregnancy outcome" OR "pregnancy complications" OR "gestational weight gain" OR "pregnancy weight gain" OR "birth outcomes" OR "birth weight" OR "neonatal weight" OR "newborn weight" OR "birth size" OR "pregnancy-induced hypertension" OR "hypertensive disorders" OR "gestational diabetes" OR "glycemic outcomes" OR "premature birth" OR "preterm birth" OR "fetal growth"). The search strategy quality was assessed by an investigator with experience in systematic reviews and expertise in the subject in accordance with the Peer Review of Electronic Search Strategies (PRESS) checklist [30]. The full search strategy for each database is available in Supplementary Materials Table S2.

2.3. Study Selection

The selection process for the review was independently conducted by two reviewers (WOP and ESOP) in two steps. First, the titles and abstracts of all retrieved articles were screened, according to the eligibility criteria. Then, the selected potentially eligible studies were submitted for full-text analysis. Articles that met the eligibility criteria were included in the review. Disagreements were resolved by consensus. Duplicates were identified and removed using the reference management tool Mendeley Desktop (version 1.19.8). The Rayyan QCRI software (Qatar Computing Research Institute®, Doha, Qatar) was used for the screening of articles.

2.4. Data Extraction

Data extraction was carried out by one author and cross-checking of all information was performed by a second author using a standardized spreadsheet. The following data were extracted from the original selected articles: authors and year of publication, data collection year, follow-up time, year of publication, study design, the country in which the study was conducted, sample size, age of participants, gestational age, denomination and composition of dietary components, dietary assessment methods, main outcomes, outcome measures, measures of effect size with confidence interval (CI), details of adjustment for confounding factors, and study funding/support information. When multiple estimates were reported, the results with adjustment for the highest number of confounders were used. When necessary, the respective study authors were contacted to retrieve additional information. At least two attempts were made to request missing or additional information.

2.5. Appraisal of Methodological Quality

Two investigators (W.O.P and E.S.O.P.) independently assessed the methodological quality of each included study using the Joanna Briggs Institute Critical Appraisal tools according to each study design (cohort, cross-sectional, and case-control) [31]. The tool consists of questions answered as "yes", "no", "unclear", or "not applicable". In this study, the risk of bias was considered low when all items were answered "yes" or "not applicable"; If the response to any item was "no" or "unclear", a high risk of bias was expected. Disagreements were resolved by consensus. The analysis of the relative frequency of each investigated domain was presented and no scores were assigned.

2.6. Summary Measures and Data Analysis

The primary outcomes were the associations between UPF-rich diet consumption and maternal (GWG, GDM, or HDP) and neonatal (LBW, large for gestational age (LGA), or preterm birth) outcomes along with the respective 95% confidence intervals (CI).

Meta-analysis was conducted when at least three studies provided data for a given outcome. In order to minimize heterogeneity, the meta-analysis included only prospective cohort studies, since it is the most adequate approach to assess associations. The overall associations were analyzed using the DerSimonian and Laird random-effects models. Based on data availability, the odds ratio (OR) and 95% CI were measured for maternal (GWG, GDM, or HDP) and neonatal (LBW, large for gestational age (LGA), or preterm birth) outcomes. If studies reported a measure of relative risk (RR), it was converted to OR using the proposed methods of Zhang and Yu [32]. Studies that report the coefficient (β) of the regression were analyzed separately. Statistical heterogeneity between studies was measured using the I-Square (I^2). Heterogeneity was considered important if I^2 values were higher than 40% [33]. Data analysis was performed using Stata software (StataCorp. 2019. Stata Statistical Software: Release 16.1. College Station, TX: StataCorp LLC). When eligible studies did not report data in a form that could be included in the meta-analysis, they were included in the systematic review and qualitatively analyzed. Cross-sectional and case-control studies were also narratively summarized. Publication bias analyses

were performed when at least ten studies were available for an outcome measure using Egger's test with a 5% significance level and funnel plot visual inspection [33].

2.7. Quality of Meta-Evidence

The Grading of Recommendations Assessment, Development, and Evaluation (GRADE) system was used to evaluate the certainty of the evidence for each exposure–outcome association based on the major domains of study limitations. The quality of evidence was downgraded based on five criteria: risk of bias, inconsistency of results, indirectness of evidence, imprecision, and publication bias when it was assessed [34].

3. Results

3.1. Selection of Studies

The flow chart of the study selection process is presented in Figure 1. The database search retrieved 11.089 articles. After the removal of duplicates, 4.918 article titles and abstracts were screened. Of these, 151 full-text articles were further assessed for eligibility and, finally, 61 studies [4,18–22,35–89] met the inclusion criteria and were included in this systematic review. The complete list of reasons for the exclusion of articles is presented in Supplementary Materials Table S3.

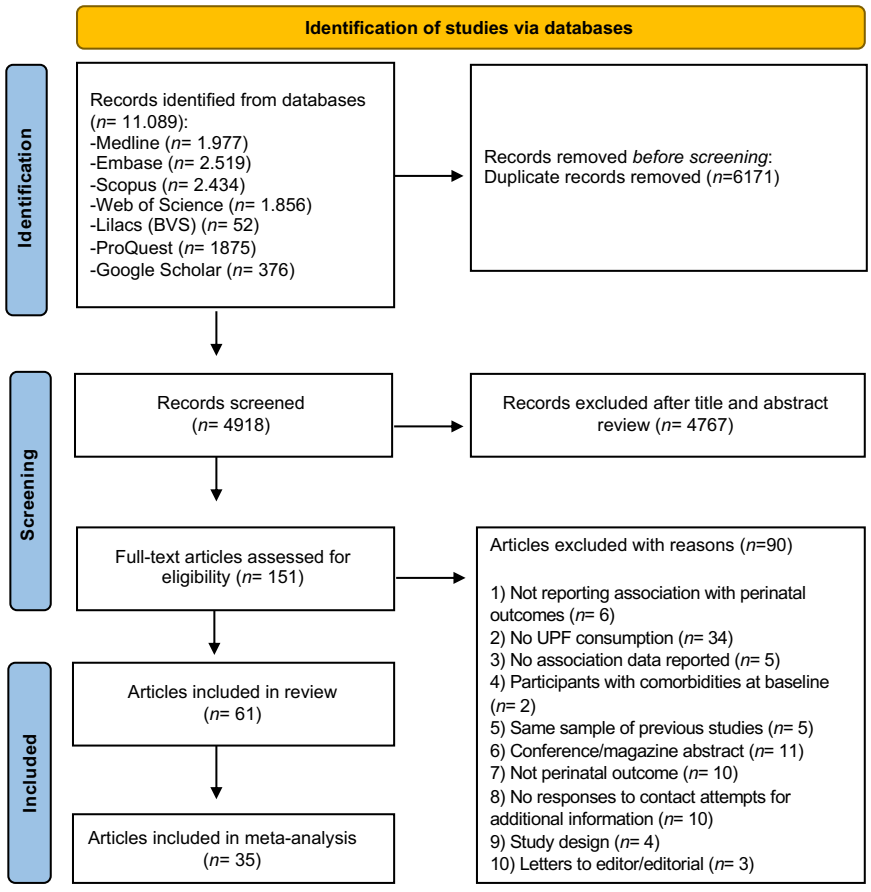


Figure 1. Flowchart of the study selection process. Adapted from PRISMA.

3.2. Study Characteristics

The articles were published between 2006 [57] and 2022 [89]. The sample ranged from 45 [4] to 94.062 [48] with 698.803 pregnant women evaluated in total. The included studies were conducted in Africa [50,51], Asia [19,35–49], America [4,18,52–65,89], Europe [20,21,66–86] and Oceania [22,87,88]. Forty-seven of the studies had a cohort design [4,18–

20,36,40,42,44,46,48–60,62,63,66–79,81–88], nine were cross-sectional [22,43,45,47,61,64,65,80,89] and five case-control [21,35,37,38,41]. Maternal mean age ranged from 24 ± 8 [37] to 37 ± 4 years old [67] and gestational week from ≤6 [19] to 37 [64] in baseline.

Regarding the exposure to UPF-rich diet consumption, seventeen articles assessed Western Diet Pattern (characterized by the presence of unhealthy foods such as savory and sweet snacks, cakes, cookies, desserts, refined grains, processed meats, fast foods, confectionaries and soft drinks) [20,35–41,51,57,62,67,68,71,80,83,85]; the intake of sweetened beverages was explored in twelve articles [46,49,52,56,64,70,72,73,75,78,79,82]; and specific manufactured food groups including UPF were analyzed in twelve articles [4,18,22,43,44,55,59,60,76,81,89]. In addition, studies also reported maternal consumption of junk foods [50,87], processed meats [65,69], snacks [61,84], industrial sweets [21,58,65], fast foods [19,42,50,54,66,74,77], "unhealthy food pattern" [45,86,88], "high salt pattern" [35], and ready-to-eat food [48].

Regarding to maternal outcomes, GWG was investigated in thirteen articles [4,18,36,42,51,58,64,67,77,81,84,89,90]; fifteen explored the association between maternal consumption and GDM [19,38,41,42,49,56,57,61,62,64,69,71,72,74,78]; and eight reported HDP, including maternal hypertension [20,35,39,52] and preeclampsia [20,37,39,45,75,76]. Two articles explored depressive symptoms during pregnancy [46,88]. Neonatal outcomes included LBW, investigated in eleven articles [21,40,43,44,47,48,53,65,73,80,86]; LGA, investigated in eight articles [47,50,54,66,68,73,82,87]; birth length, explored in four articles [48,54,60,86]; one publication reporting body mass index (BMI)/age at birth [59]; five reporting preterm birth [22,48,55,83,85]; and offspring congenital heart defects, examined in two publications [70,79].

3.3. Results of Individual Studies

A summary of the characteristics and main results of each study is presented in Table 1. Regarding the cohort studies evaluating GWG, higher odds ratios of excessive GWG were associated with snack dietary pattern (OR: 1.01; 95% CI:1.004, 1.032) [84], UPF dietary patterns such as margarine, sugar, and chips (OR: 1.45; 95% CI: 1.06, 1.99) [81], and Western dietary pattern (OR: 4.04; 95% CI: 1.07, 15.24) [36]. Gomes et al. [18] showed that each 1% increase in energy intake from UPF was associated with a mean increase of 4.17 g in weekly gestational weight (95% CI: 0.5, 7.79). Other studies also presented an increase in GWG rate associated with a UPF-rich diet consumption. Rohatgi et al. found that each one percent increase in energy intake from UPF was associated with 1.33 kg increase in total GWG (CI: 0.3, 2.4) [4]. Similarly, Maugeri et al. showed that a Western diet consumption was associated with an increase of 1217 kg in total GWG (p = 0.013) [67]. A UPF rich-diet was also associated with a slight increase of 0,029 kg (β: 0.029; 95% CI: 0.012, 0,049) [42] and 0,01 kg (β: 0.010; SE: 0.003; p = 0.004) in weekly GWG [77]. Conversely, Hirko et al. [58] observed that intake of added sugar (including soft drinks, sugary fruit-flavored drinks, candies and cookies, cakes, pies, or brownies) was associated with a slight reduction in the likelihood of excessive GWG (OR: 0.91; 95% CI: 0.84, 0.99).

Lamyian et al. [19] observed greater chances of developing GDM among pregnant women with higher consumption of fast foods (OR: 2.12; 95% CI: 1.12, 5.43). Six cohort studies also identified an association between the consumption of UPF and a higher risk of GDM [56,57,69,71,74,78]. Three studies [49,62,71] found no significant association.

A Brazilian cohort [52] identified an association between soft drink consumption and hypertension during pregnancy (RR: 1.45; 95% CI: 1.16, 1.82). Ikem et al. [20] showed that higher consumption of the Western dietary pattern increased the odds of gestational hypertension by 18% (OR: 1.18; 95% CI: 1.05, 1.33). On the other hand, Hajianfar et al. [39] observed that consumption of the Western pattern was associated with lower chances of systolic (OR: 0.13, 95% CI: 0.04, 0.42) and diastolic (OR: 0.08; 95% CI: 0.01, 0.67) hypertension. Our results present a positive association between UPF consumption and preeclampsia observed in four cohort studies [20,39,75,76].

Table 1. Summary of included studies characteristics.

Author, Year Country	Study Design	Age (Years)	GW (Range or Mean)	Sample n =	Exposure	Outcome	Main Results
Abbasi et al., 2019 Iran [37]	Case-control	case: 24 ± 8 control: 26 ± 6	>20 weeks	case: 170 control: 340	WDP (red and processed meat, fried potatoes, pickles, sweets, pizza)	Risk of preeclampsia	The Western dietary pattern associated with preeclampsia: OR: 5.99; 95% CI: 3.414, 10.53; $p < 0.001$)
Alves-Santos et al., 2019 Brazil [54]	Prospective Cohort	26.7 ± 5.5	5–13 weeks	193	Fast foods and candies (fast food and snacks; cakes, cookies, or crackers; and candies or desserts)	LGA Birth Length (BL)	Fast food and candies dietary pattern associated with LGA newborn: OR: 4.38; 95% CI: 1.32, 14.48 Fast food and candies dietary pattern associated with the newborn with BL > 90th percentile: OR: 4.81; 95% CI: 1.77, 13.07
Amezcua-Prieto et al., 2019 Spain [21]	Case-control	NR	NR	518	Industrial sweets	SGA	Intake of industrial sweets associated with odds of having an SGA newborn (OR: 2.70; 95% CI: 1.42, 5.13).
Ancira-Moreno et al., 2020 Mexico [53]	Prospective Cohort	25.08 ± 5.8	2nd and 3rd trimester	660	Mixed dietary patterns (sugary drinks, juices and sodas, red and processed meat, cereals)	LBW	The mixed dietary pattern associated risk LBW infant: (OR: 1.58; 95% CI: 0.63, 3.44)
Angali, Shahri, Borazjani, 2020, Iran [42]	Prospective Cohort	≥18 years	<13 weeks	488	"High fat - fast food" pattern (refined cereal, processed meat and high-fat dairy and juices)	GWG and hyperglycemia	High fat-fast food patterns associated with higher GWG (β: 0.029; 95% CI: 0.012, 0.049).
Asadi et al., 2019 Iran [38]	Case-control	case: 29 ± 5.17 control: 27.5 ± 4.92	24–28 weeks	case: 130 control: 148	WDP (SSB, refined grain products, fast foods, salty snacks, sweets and biscuit, mayonnaise)	GDM	The prudent dietary pattern associated with GDM risk: (OR: 0.88; 95% CI: 0.44, 0.99)
Barbosa et al., 2021 Brazil [52]	Prospective Cohort	>14	22–25 weeks	2750	Soft drinks	Gestational Hypertension (GH)	Soft drink consumption > 7 times per week associated with GH: (RR: 1.45; 95% CI: 1.16, 1.82; $p = 0.001$)
Bärebring et al., 2016 Sweden [84]	Prospective Cohort	32.1 (IQR: 30.8–35.3)	35.9 weeks (IQR: 35.1–36.4)	95	Snacks pattern (sweets, cakes, biscuits, potato chips, popcorn)	GWG	Snacks pattern associated with excessive GWG (OR: 1.018; 95% CI: 1.004, 1.032).
Baskin et al., 2015 Australia [88]	Prospective Cohort	30.55 ± 4.24	16 weeks	167	Unhealthy dietary patterns (sweets and desserts, refined grains, high- energy drinks, fast	Depressive symptoms	An unhealthy diet at T2 is associated with depressive symptoms: β: 0.19; 95% CI=0.04, 0.34; $p < 0.05$

					foods, hot chips, high-fat dairy, fruit juice and red meats)		
Borgen et al., 2012 Norway [75]	Prospective Cohort	>18 years	15 weeks	32,933	SSB	Preeclampsia	Sugar-sweetened beverages associated with increased risk of preeclampsia: OR: 1.27; 95% CI: 1.05, 1.54
Brantsæter et al., 2009 Norway [76]	Prospective Cohort	>18	20.7 weeks (SD ±3.7)	23,423	Dietary patterns (Processed meat products, white bread, French fries, salty snacks, and sugar-sweetened drinks)	Risk of preeclampsia	Processed food patterns are associated with increased risk of developing preeclampsia (OR: 1.21; 95% CI: 1.03, 1.42).
Chen et al., 2009 USA [56]	Prospective Cohort	24–44	NR	13,475	SSB	Risk of gestational diabetes mellitus (GDM)	Intake of sugar-sweetened cola associated with risk of GDM (RR: 1.22; 95% Cl: 1.01, 1.47).
Chen et al., 2020 China [35]	Case-control	case: 28 ± 1.3 control: 28 ± 1.5	>22 weeks	case: 1290 control: 1290	High-salt pattern (pickled vegetables, processed and cooked meat, fish and shrimp, bacon and salted fish, bean sauce)	Hypertensive disorder during pregnancy	High-salt pattern diets associated with higher systolic blood pressure: (r: 0.110; $p < 0.05$)
Coelho et al., 2015 Brazil [63]	Prospective Cohort	24.7 ± 6.1	≥22 weeks	1298	Snack dietary patterns (sandwich cookies, salty snacks, chocolate, and chocolate drink)	Birth weight	Snack dietary patterns positively associated with birth weight: (β: 56.64; $p = 0.04$) in pregnant adolescents.
Dale et al., 2019 Norway [79]	Prospective Cohort	≥18	16-18 weeks	88,514	SSB	CHD	25–70 mL/day sucrose-sweetened soft beverages associated with non-severe CHD (RR:1.30; 95% CI: 1.07, 1.58) and (RR: 1.27; 95% CI: 1.06, 1.52) for ≥70 mL/day.
Dominguez et al., 2014 Spain [74]	Prospective Cohort	>18	NR	3048	Fast food	GDM	Fast food consumption associated with GDM risk: (OR: 1.86; 95% CI: 1.13, 3.06)
Donazar-Ezcurra et al., 2017 Spain [71]	Prospective Cohort	>18	NR	3455	WDP (red meat, high-fat processed meats, potatoes, commercial bakery products, whole dairy products, fast foods, sauces,	GDM	The Western dietary pattern associated with GDM incidence: (OR: 1.56; 95% CI: 1.00, 2.43; $p = 0.05$)

					pre-cooked foods, eggs, soft drinks and sweets, chocolates)		
Donazar-Ezcurra et al., 2017 Spain [72]	Prospective Cohort	>18	NR	3396	Soft drinks	GDM	Sugar-sweetened soft drinks (SSSD) associated with GDM: (OR: 2.06; 95% CI: 1.28, 3.34; *p*: 0.004)
Englund-Ögge et al., 2014 Norway [85]	Prospective Cohort	<20 to ≥40	15 weeks	66,000	WDP (salty snacks, chocolates and sweets, French fries, cakes, white bread, ketchup, dairy desserts, SSB, mayonnaise, processed meat, waffles, pancakes, cookies)	Preterm delivery	Western diet pattern associated with risk of preterm delivery (Hazard Ratio: 1.02; 95% CI: 0.92, 1.13).
Englund-Ögge et al., 2019 Norway [68]	Prospective Cohort	>18 years	15 weeks	65,904	WDP (salty snacks, chocolate and sweets, cakes, French fries, white bread, ketchup, SSB, processed meat products, and pasta)	LGA	The prudent pattern associated with decreased LGA risk: (OR: 0.84; 95% CI: 0.75, 0.94) The traditional group associated with increased LGA risk: (OR: 1.12; 95% CI: 1.02, 1.24)
Ferreira et al., 2022 Brazil [89]	Cross-sectional	28 (IQR 19–45)	NR	260	Dietary patterns (sweets, snacks and cookies)	GWG	Women with greater adherence to "Pattern 2" (sweets, snacks, and cookies) during pregnancy were less likely to have inadequate GWG (OR: 0.14; 95% CI = 0.03, 0.60)
Garay et al., 2019 United Kingdom [80]	Cross-sectional	18–45 years	NR	303	WDP (cakes/biscuits/ice cream, chips/crisps, processed meat, takeout, chocolate, soft drinks)	CBWC	Health-conscious dietary pattern associated with increased CBWC (OR: 4.75; 95% CI: 1.17, 8.33; *p* = 0.010) "Western Diet" associated with increased CBWC (β: −2.64; 95% CI: −5.87, 0.59; *p* = 0.109)
Gomes et al., 2020 Brazil [18]	Prospective Cohort	≥18 years	All trimesters	259	UPF energy (cookies, sweets, SSB, reconstituted meats, crackers, packaged chips, frozen dinners, ultra-processed breads)	GWG	Energy percentage derived from UPF associated with average weekly GWG (β: 4.17; 95% CI 0.55, 7.79).
Grieger, et al., 2014 Australia [22]	Cross-sectional	>18	13 weeks	309	Dietary patterns (high-fat/sugar/takeaway: takeaway foods, potato chips,	Preterm delivery	High-fat/sugar/takeaway pattern associated with preterm birth: (OR: 1.54; 95% CI: 1.10, 2.15; *p* = 0.011)

					refined grains, and added sugar)		
Grundt et al., 2016 Norway [73]	Prospective Cohort	>18	15 weeks	50,280	SSC	BW	Each 100 mL intake of SSC associated with: 7.8 g decrease in BW (95% CI: −10.3, 5.3); decreased risk of BW > 4.5 kg (OR: 0.94; 95% CI: 0.90, 0.97) and increased risk of BW < 2.5 kg (OR: 1.05; 95% CI: 0.99, 1.10).
Günther et al., 2019 Germany [66]	Prospective Cohort	30.3 ± 4.4	<12 weeks	1995	Fast foods	LGA	Fast food consumption associated with LGA: (OR 3.14; 95% CI: 1.26,7.84; $p = 0.014$)
Hajianfar et al., 2018 Iran [39]	Prospective Cohort	20–40	8–16 weeks	812	WDP (processed meats, fruits juice, citrus, nuts, desserts and sweets, potato, legumes, coffee, egg, pizza, high fat dairy, and soft drinks)	Preeclampsia Hypertension	The Western dietary pattern is associated with: Preeclampsia: (OR: 2.08; 95% CI: 1,4.36, $p = 0.02$) High systolic blood pressure: (OR: 0.13; 95% CI: 0.04, 0.42; $p = 0.002$)
Hajianfar et al., 2018 Iran [40]	Prospective Cohort	29.4 ± 4.85	8–16 weeks	812	WDP (processed meats, fruits juice, citrus, nuts, desserts and sweets, potato, legumes, coffee, egg, pizza, high fat dairy, and soft drinks)	LBW	Western dietary pattern (top quartile) associated with LBW infant: (OR: 5.51; 95% CI: 1.82, 16.66; $p = 0.001$)
Hirko et al., 2020 USA [58]	Prospective Cohort	mean: 27	mean: 13.4 weeks	327	Dietary patterns (added sugar: soda, fruit-flavored drinks with sugar, pastries—donuts, sweet rolls, Danish, and cookies, cake, pie, or brownies)	GWG	Higher added sugar intake associated with excessive GWG (OR: 0.91; 95% CI: 0.84, 0.99)
Ikem et al., 2019 Denmark [20]	Prospective Cohort	25–30	12 weeks	55,139	WDP (potatoes, French fries, bread white, pork, beef veal, meat mixed, meat cold and dressing sauce)	Gestational hypertension Preeclampsia	Western diet associated with GH: (OR: 1.18; 95% CI: 1.05, 1.33) Preeclampsia: (OR: 1.40; 95% CI: 1.11, 1.76):
Itani et al., 2020 United Arab Emirates [36]	Prospective Cohort	19–40	27–42 weeks	242	WDP (sweets, sweetened beverages, added sugars, fast food, eggs, and offal)	GWG	The Western pattern is associated with excessive gestational weight gain (OR: 4.04; 95% CI: 1.07, 15.24)

							The western pattern is associated with gestational weight gain rate (OR: 4.38; 95% CI: 1.28, 15.03)
Ker et al., 2021 Taiwan [46]	Prospective Cohort	33.9 ± 4.6	All trimesters	196	SSB	Postpartum depression	SSB intake associated with increased EPDS scores: (β: 0.25; 95% CI: 0.04, 0.45) during the first and second trimesters
Lamyian et al., 2017 Iran [19]	Prospective Cohort	18–45 years	≤6 weeks	1026	Fast food	GDM	Fast food consumption (≥175 g/week) associated with GDM risk: (OR: 2.12; 95% CI: 1.12, 5.43; *p*-trend: 0.03
Liu et al., 2021 China [47]	Cross-sectional	26.88 ± 4.62	All trimesters	7934	Dietary patterns (snacks pattern: beverages, sweetmeat, fast-food, dairy and eggs)	Macrossomia SGA	Snacks pattern associated with: risk of macrosomia: (OR: 1.265; 95% CI: 1.000, 1.602) SGA: (OR: 1.260; 95% CI: 1.056, 1.505).
Loy, Marhazlina; Jan 2013 Malaysia [43]	Cross-sectional	29.7 ± 4.8	33.66 ± 3.95 weeks	108	Dietary patterns (confectioneries: cake, cookies, chocolate, candy, sweetened condensed milk)	LBW	Confectioneries food intake associated with lower birth weight: (β: −1.999; $p = 0.013$)
Marí-Sanchiz et al., 2017 Spain [69]	Prospective Cohort	>18	NR	3298	UPF (Processed meat)	GDM	Processed meat consumption associated with GDM: (OR: 2.01; 95% CI: 1.26, 3.21; *p*-trend 0.003)
Marquez, 2012 USA [64]	Cross-sectional	18–49	≥37 weeks	290	SSB	GWG	A high intake of regular soda is associated with an increased risk of Excessive GWG (OR: 1.41; 95% CI: 0.60, 3.31).
Martin et al., 2016 Sweden [59]	Prospective Cohort	16–47	39 ± 2 weeks	389	Dietary patterns (latent class 3: white bread, red and processed meats, fried chicken, French fries, and vitamin C–rich drinks)	BMI-for-age at birth	Association between the latent class 3 diet (processed food) and BMI-for-age z-score at birth: (β: −0.41; 95% CI: −0.79, −0.03).
Martin et al., 2015 USA [55]	Prospective Cohort	NR	24–29 weeks	3941	Dietary patterns (hamburgers or cheeseburgers, white potatoes, fried chicken, beans, corn, spaghetti dishes, cheese dishes, processed meats, biscuits, and ice cream)	Preterm birth	Diet characterized by ultra-processed food associated with preterm birth: (OR: 1.53; 95% CI: 1.02, 2.30)

Maugeri et al., 2019 Italy [67]	Prospective Cohort	15–50 (Mean: 37)	4–20 weeks (Mean: 16)	232	WDP (high intake of red meat, fries, dipping sauces, salty snacks and alcoholic drinks)	GWG	Western dietary patterns associated with GWG: (β: 1.217; Standard Error: 0.487; $p = 0.013$)
Mikeš et al., 2021 Czech Republic [86]	Prospective Cohort	25 ± 5	32 weeks	4320	Unhealthy Dietary pattern: (pizza, fish products, processed meat, sausages, smoked meat, hamburgers, and confectionary foods, sugary drinks, cakes, chocolate and sweets).	Birth Weight Birth Length	A 1-unit increase in the unhealthy pattern score was associated with a mean birth weight reduction of −23.8 g (95% CI: −44.4, −3.3; $p = 0.023$); a mean birth length reduction of −0.10 cm (95% CI: −0.19, −0.01; $p = 0.040$).
Mitku et al., 2020 South Africa [50]	Prospective Cohort	<25 to >30	1st and 2nd trimesters	687	Junk food (sweets, muffins, chips, mixed salad, fruit juice, fizzy soft drinks, vetkoek, coffee creamer, cooking oil, hamburgers, cooked vegetables, cereals rice, margarine)	Birth Weight	Junk food intake is associated with an increase in birth weight ($p < 0.001$).
Nascimento et al., 2016 Brazil [62]	Prospective Cohort	26.2 ± 5.8	26.4 weeks (SD ± 0.8)	841	WDP (white bread, savory, sweet, chocolate, cookies, soft drinks, pasta, fried food, pizza, chicken, canned food)	GDM	Association between GDM incidence and dietary patterns (RR: 0.78; 95%CI: 0.43, 1.43)
Nicolì et al., 2021 Italy [78]	Prospective Cohort	35.75 ± 5.53	NR	376	Soft drink	GDM	Non-nutritive-sweetened soft drink consumption associated with GDM (OR: 1.766; 95% CI: 1.089, 2.863; $p = 0.021$)
Okubo et al., 2012 Japan [44]	Prospective Cohort	≥18	All trimesters	803	Dietary patterns (wheat products pattern: bread, confectioneries, fruit and vegetable juice, and soft drinks)	SGA birth	Wheat products pattern associated with SGA infant: (OR: 5.2; 95% CI: 1.1, 24.4)
Rasmussen et al., 2014 Denmark [83]	Prospective Cohort	21–39	2nd trimester	69,305	WDP (French fries, white bread, meat mixed, margarine, dressing sauce, chocolate milk, soft drink, cakes, chocolate, candy, sweet spread, dessert dairy)	Preterm Birth	Western diet associated with preterm delivery (OR: 1.30; 95% CI: 1.13, 1.49)

Rodrigues, Azeredo, Silva, 2020, Brazil [65]	Cross-sectional	24.9 ± 6.5	39.4 weeks (SD ± 1.2)	99	Processed meat	LBW	Maternal consumption of sausages associated with LBW: (OR: 1.46; 95% CI: 1.02, 2.10)
Rohatgi et al., 2017 USA [4]	Prospective Cohort	27.2 ± 5.1	32–37 weeks	45	UPF energy intake	GWG	Each 1% increase in UPF energy intake associated with increase in GWG: (β: 1.33; 95% CI: 0.3, 2.4; $p = 0.016$)
Schmidt et al., 2020 Denmark [70]	Prospective Cohort	NR	12 weeks	66,387	Soft drinks	CHD	High intake of sugar-sweetened carbonated beverages (≥4 servings) associated with CHD: (OR: 2.41; 95% CI: 1.26, 4.64; p-trend = 0.03.)
Sedaghat et al., 2017 Iran[41]	Case-control	case: 29.64 ± 4.52 control: 29.76 ± 4.26	case: 29.39 ± 4.74 weeks control: 31.19 ± 3.53 weeks	case: 122 control: 266	WDP (sweet snacks, mayonnaise, SSB, salty snacks, solid fats, high-fat dairy, red and processed meat, and tea and coffee)	GDM	Western dietary patterns associated with GDM risk: (OR: 1.68; 95% CI: 1.04, 2.27)
Tamada et al., 2021 Japan [48]	Prospective Cohort	30.7 years (SD ± 5.1)	14.4 weeks (SD ± 5.6)	94,062	Ready-made meals (pre-packed foods, instant noodles, soup)	Stillbirth Preterm Birth LBW	Ready-made meals associated with stillbirth: (OR: 2.632; 95% CI: 1.507, 4.597; q = 0.007); Preterm birth: (OR: 0.993; 95% CI: 0.887, 1.125) LBW: (OR: 0.961; 95% CI: 0.875, 10.56)
Teixeira et al., 2020 Brazil [60]	Prospective Cohort	mean: 25.9	10–11 weeks	299	Dietary patterns (processed meats, sandwiches and snacks, sandwich sauces, desserts and sweets, soft drinks)	SGA	Dietary pattern with snacks, sandwiches, sweets, and soft drinks associated with the risk to deliver SGA babies: (RR: 1.92; 95% CI: 1.08, 3.39)
Tielemans et al., 2015 Netherlands [81]	Prospective Cohort	31.6 (IQR ± 4.3)	13.4 weeks (IQR: 12.2–15.5)	3374	Dietary patterns (margarine—solid and liquid, sugar and confectionary, cakes, chocolate, candy, snacks)	GWG	Margarine, sugar, and snacks pattern are associated with a higher prevalence of excessive GWG: (OR: 1.45; 95% CI: 1.06, 1.99)
Uusitalo et al., 2009 Finland [77]	Prospective Cohort	29.2 ± 5.2	10 weeks	3360	Dietary patterns (fast food: sweets, fast food, snacks, chocolate, fried potatoes, soft drinks, high-fat pastry, cream, fruit juices, white bread, processed meat, sausage)	GWG	Fast food patterns associated with weight gain rate: (β: 0.010; SE: 0.003; $p = 0.004$)
Wen et al., 2013	Prospective Cohort	>16	24–34 weeks	368	Junk food diet	LGA	Junk food diet versus without a junk food diet

Australia [87]					(soft drinks, processed meat, meals, chips or French fries)		associated with a newborn LGA: (OR: 0.36; 95% CI: 0.14, 0.91; $p = 0.03$)
Wrottesley, Pisa & Norris, 2017; South Africa [51]	Prospective Cohort	≥18	All trimesters	538	WDP (white bread, cheese and cottage cheese, red meat, processed meat, roast potatoes and chips, sweets, chocolate, soft drinks, miscellaneous)	GWG	Western dietary pattern associated with excessive GWG (OR: 1.07; 95% CI: 0.78, 1.45; $p = 0.682$)
Yong et al., 2021 Malaysia [49]	Prospective Cohort	30.01 ±4.48	1st trimester	452	Beverages (carbonated and juices)	GDM	Higher fruit juice intake associated with GDM (OR: 0.92; 95% CI: 0.89, 0.98).
Zareei et al., 2019 Iran [45]	Cross-sectional	28.96 ± 5.85	NR	82	Dietary patterns (unhealthy dietary patterns: mayonnaise, fries, red meat, soft drinks, pizza, snacks, sweets and dessert, refined cereal, hydrogenated oils, high-fat dairy products, sugar, processed meat, broth.)	Preeclampsia	The unhealthy dietary pattern associated with preeclampsia (OR: 1.381; 95% CI: 0.462, 4.126, $p = 0.564$)
Zhang et al., 2006 USA [57]	Prospective Cohort	>18	NR	13,110	WDP (red and processed meat, refined grain products, sweets, French fries and pizza)	GDM	Western pattern score associated with GDM risk (RR: 1.63; 95% CI: 1.20, 2.21; $p = 0.001$); Red meat associated with GDM risk: (RR: 1.61; 95% CI: 1.25, 2.07) Processed meat associated with GDM risk: (RR: 1.64; 95% CI: 1.13, 2.38)
Zhu et al., 2017 Denmark [82]	Prospective Cohort	>18	25 weeks	918	Soft drinks	Birth weight	Daily soft drinks consumption associated with offspring risk of LGA: (RR: 1.57; 95% CI: 1.05, 2.35)
Zuccolotto et al., 2019 Brazil [61]	Cross-sectional	27.6 ± 5.4	24–39 weeks	785	Snack dietary patterns (breads; butter and margarine; Processed meat, sweets, chocolate milk and cappuccino)	GDM	Dietary patterns associated with GDM risk: (OR: 1.01; 95% CI: 0.63, 1.63)

BMI: body mass index; BW: birth weight; CBWC: customized birthweight centiles; CI: confidence interval; CHD: congenital heart defects; EPDS: Edinburgh Postpartum Depression Scores; GDM: gestational diabetes mellitus; GWG: gestational weight gain; IQR: interquartile range; LBW: low birth weight; LGA: large for gestational age; NR: not reported; OR: odds ratio; RR: relative risk; SD: standard deviation; SGA: small for gestational age; SSB: sugar-sweetened Beverage; SSC: sugar-sweetened carbonated beverages; UPF: ultra-processed food; WDP: Western dietary pattern.

Depressive symptoms during pregnancy were also investigated in two cohort studies. Ker et al. [46] reported that increased consumption of sugar-sweetened beverages was associated with higher depression scores (β = 0.25; 95% CI: 0.04, 0.45). Likewise, Baskin et al. [88] found a positive association between an "unhealthy" diet (characterized by the intake of UPF and unhealthy foods such as condiments, sweets and desserts, refined grains, high-energy drinks, fast foods, hot chips, high-fat dairy, fruit juice, and red meats) and increased depressive symptoms during gestation (β = 0.19; 95% CI: 0.04, 0.34).

Regarding neonatal outcomes, Hajianfar et al. [40] and Okubo et al. [44] reported that pregnant women with the highest consumption of UPF were 5.51 (95% CI: 1.82,16.66) and 5.24 (95% CI 1.1, 24.4) times more likely to have children with LBW (<2.5 kg), respectively.

A positive association between maternal UPF consumption and higher birth weight was observed in one cohort [21] whereas no association was observed in four studies [48,53,63,73]. Maternal fast food [54,66] and soft drink [82] intake were associated with LGA birth. Moreover, Grundt et al. [73] observed an inverse association between soft drink consumption and LGA risk.

Two cohorts reported higher odds of preterm birth. Martin et al. [55] and Rasmussen et al. [83] reported that UPF consumption during pregnancy increased preterm birth odds by 53% (OR: 1.53; 95% CI: 1.02, 2.30) and 30% (OR: 1.30; 95% CI: 1.13, 1.49), respectively. In opposition to these results, two cohort studies found no significant association [48,85].

Alves-Santos et al. [54] found that fast food consumption was associated with higher odds of birth length > 90th percentile (OR: 4.81; 95% CI: 1.77, 13.07). Teixeira et al. [60] observed that women who consumed more "snacks, sandwiches, sweets and soft drinks" were significantly more likely to deliver SGA (birth weight and birth length <10th percentile) babies (RR: 1.92; 95% CI: 1.08, 3.39). Mikes et al. [86] showed that higher consumption of unhealthy foods (confectionary, fried, and processed meats) was associated with lower birth length: (β = −0.10 cm; 95% CI: −0.19, −0.01). One study explored BMI-for-age z score at birth and reported a decrease of 20.41 standard deviations (SD) (95% CI: 20.79, 20.03) associated with a diet characterized by a high intake of white bread, red and processed meat, French fries, fried chicken, and vitamin C–rich drinks [59]. Finally, two studies reported a positive association between maternal soft drink intake during pregnancy and higher odds of CHD [70,79].

Selected cross-sectional studies (n = 9) examined the association between maternal UPF consumption and perinatal outcomes. No significant association was observed for excessive GWG [64,89], GDM risk [61,64], preeclampsia [45] and LGA [47]. Three studies [43,47,65] reported a positive association between the consumption of UPF and LBW, while one study [80] (n = 303) showed no significant association. A positive association was also observed for preterm birth (OR: 1.54; 95% CI: 1.10, 2.15) [22].

Of the five included case-control studies, one study observed that higher maternal adherence to Western diet patterns during pregnancy was associated with higher odds of GDM risk (OR: 1.68; 95% CI: 1.04, 2.72) [41]. On the other hand, Asadi et al. did not find such an association [38]. A positive association was observed between higher consumption of UPF and higher systolic blood pressure (r = 0.110, $p < 0.05$) [35], preeclampsia (OR: 5.99; 95% CI: 3.41, 10.53) [37] and LBW (OR: 2.7; 95% CI: 1.42, 5.13) [21].

3.4. Risk of Bias within Individual Studies

The frequency of the items assessed as an indicator of the risk of bias in studies is illustrated according to the study design in Figure 2. Of 47 cohort studies, 24 (51%) were considered at low risk of bias [18–20,36,39,40,44,49–51,54,60,66,67,69–75,79,82,83]. Two indicators were accomplished in all studies: "confounding factors identified" and "strategies to deal with confounding factors stated". Most studies were at high risk of bias due to not presenting the strategies to address incomplete follow-up, which is considered a potential source of bias [4,42,52,53,56,59,63,68,76,78,85–87]. Most of cross-sectional studies (77.7%) were at low risk of bias [22,43,45,61,64,65,80]. Two studies presented a high risk of bias. One article [89] did not use a reliable method to measure the assessed outcome;

the other one [47] did not accomplish two of the evaluated parameters: "criteria for inclusion in the sample clearly defined" and "outcomes measured validly and reliably". Three case-control studies (60%) were classified as having a low risk of bias [37,38,41] and two studies presented a high risk of bias due to not reporting the exposure period [21] and statistical analysis [35] clearly. The complete appraisal of the methodological quality of each article is described in Supplementary Materials (Tables S4–S6).

Figure 2. Risk of bias of the included articles according to study design.

3.5. Meta-Analysis of Maternal UPF-Rich Diet Consumption and Maternal Outcomes

3.5.1. Gestational Weight Gain

Five articles were pooled in the meta-analysis, including 4.576 subjects, but no association was found between maternal UPF-rich diet consumption and excessive GWG [(OR: 1.04; 95% CI: 0.92, 1.17) I^2 = 75.22%] [36,51,58,81,84]. This association was also explored using β coefficient in five articles, including 4.384 pregnant women [4,18,42,67,77], but no significant association between UPF-rich diet consumption and GWG was found [(β = 0.02; 95% CI: −0.02, 0,06) I^2 = 80.63%].

3.5.2. Gestational Diabetes Mellitus

Ten cohort studies assessed the association between maternal UPF-rich diet consumption and GDM including 42.477 pregnant women [19,49,56,57,62,69,71,72,74,78]. The meta-analysis showed that higher consumption of diets rich in UPF significantly increased odds of GDM by 48% [(OR: 1.48; 95% CI: 1.17, 1.87) I^2 = 82.70%] (Figure 3). Publication bias analysis by the funnel plot inspection (Supplementary Figure S1) showed asymmetry among the studies, which was confirmed by Egger test (p = 0.001).

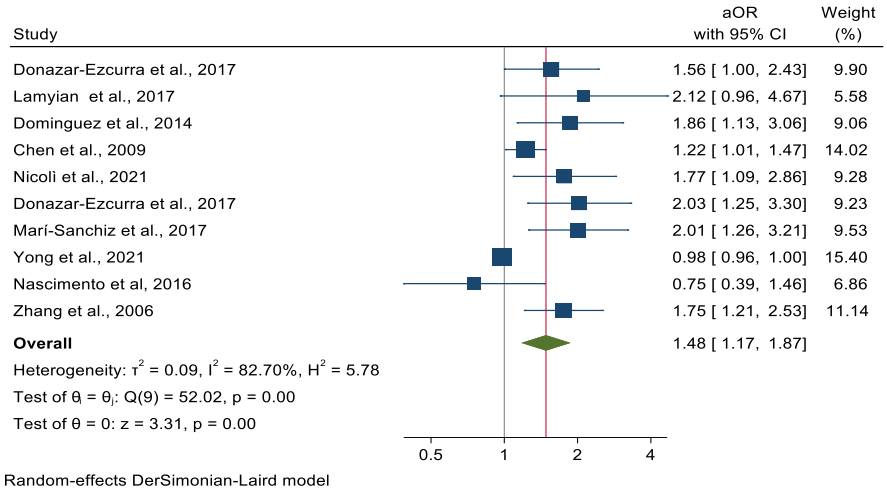


Figure 3. Meta-analysis of ultra-processed food rich diet *vs* gestational diabetes mellitus.

3.5.3. Hypertensive Disorders of Pregnancy

No significant associations were observed between UPF-rich diet consumption and the odds of hypertension during pregnancy of three cohort studies, with 58.701 subjects [20,39,52] [(OR: 0.94; 95% CI: 0.52, 1.70) I^2 = 88.80%].

On the other hand, the consumption of UPF-rich diets was found to be associated with 28% higher odds of preeclampsia in four cohort studies [20,39,75,76] involving 112.307 subjects [(OR: 1.28; 95% CI: 1.15, 1.42) I^2 = 0.00%] (Figure 4).

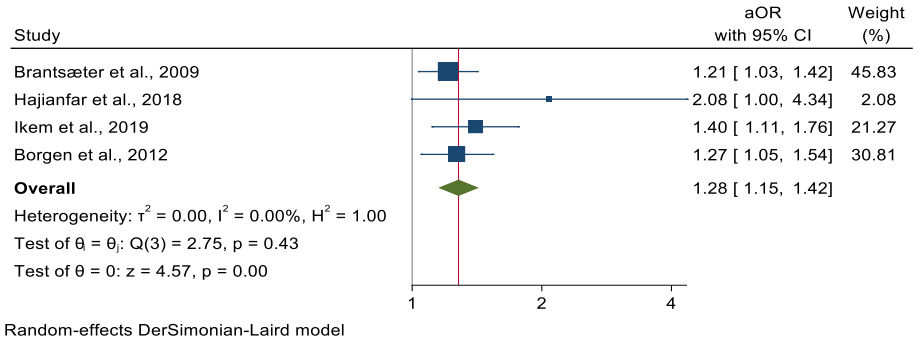


Figure 4. Meta-analysis of ultra-processed food rich diet vs. preeclampsia.

3.6. Meta-Analysis of Maternal UPF-Rich Diet Consumption and Neonatal Outcomes

3.6.1. Low Birth Weight

Five eligible cohort studies that provided an estimate of the association between maternal UPF-rich diet consumption and LBW were included in the meta-analysis

[40,44,48,53,73], involving 146.617 subjects. However, no significant association was presented [(OR: 1.08; 95% CI: 0.90, 1.30) I^2 = 74.59%].

3.6.2. Large for Gestational Age

Three eligible cohort studies (n = 52.468) investigated the association between maternal UPF-rich diet consumption and LGA. [54,66,73]. Meta-analysis results revealed no significant association between UPF-rich diet consumption and odds of LGA [(OR: 2.10; 95% CI: 0.71, 6,25) I^2 = 84.61%].

3.6.3. Preterm Birth

The meta-analysis showed no significant association [(OR: 1.13; 95% CI: 0.97, 1.32) I^2 = 76.25%] regarding the association between four cohort studies (n= 233.308) which evaluated the UPF-rich diet consumption and the odds of preterm birth. E [48,55,83,85].

3.7. Certainty of Evidence

The GRADE assessment was moderate for maternal UPF-rich diet consumption and preeclampsia (⊕⊕⊕◯) and very low (⊕◯◯◯) for GWG, GDM, LBW, LGA, and preterm birth (Table 2).

Table 2. GRADE evidence profile for maternal UPF consumption and perinatal outcomes.

Outcomes	Studies (n, References)	Risk of Bias	Inconsistency [a]	Indirectness [b]	Imprecision [c]	Publication Bias	Certainty
Maternal Outcomes							
Excessive Gestational Weight Gain	5 [36,51,58,81,84]	Not serious	Serious	Not serious	Not serious	Not assessed [d]	⊕◯◯◯ Very low
Gestational Weight Gain	5 [4,18,42,67,77]	Not serious	Serious	Not serious	Not serious	Not assessed [d]	⊕◯◯◯ Very low
Gestational Diabetes Mellitus	10 [19,49,56,57,62,69,71,72,74,78]	Not serious	Serious	Not serious	Not serious	strongly suspected [e]	⊕◯◯◯ Very low
Gestational Hypertension	3 [20,39,52]	Not serious	Serious	Not serious	Not serious	Not assessed [d]	⊕◯◯◯ Very low
Preeclampsia	4 [20,39,75,76]	Not serious	Not serious	Not serious	Not serious	Not assessed [d]	⊕⊕⊕◯ Moderate
Neonatal Outcomes							
Low Birth Weight	5 [40,44,48,53,73]	Not serious	Serious	Not serious	Not serious	Not assessed [d]	⊕◯◯◯ Very low
Large for Gestational Age	3 [54,66,73]	Not serious	Serious	Not serious	Not serious	Not assessed [d]	⊕◯◯◯ Very low
Preterm Birth	4 [48,55,83,85]	Not serious	Serious	Not serious	Not serious	Not assessed [d]	⊕◯◯◯ Very low

[a]. Downgrade 1 level if I^2 was 50% to 75%, and 2 levels if I^2 was 75% to 100%. [b]. No downgrade for indirectness because all studies directly measure the outcomes. [c]. No downgrade for imprecision because of >2000 participants for each outcome. [d]. No downgrade for publication bias, as publication bias could not be assessed due to lack of power for assessing funnel plot asymmetry and small study effects (<10 cohorts included in meta-analysis). [e]. Downgrade 1 level for publication bias ($p < 0.05$).

4. Discussion

The present systematic review highlights the role of the maternal diet, including the consequences of UPF-rich diet consumption on perinatal adverse outcomes.

There is growing evidence that high consumption of UPFs is indicative of low diet quality and associated with a higher risk of coronary heart disease, cancer, cerebrovascular and metabolic diseases, hypertension, worse cardiometabolic risk profile, and a higher risk of all-cause mortality in adult and older populations [91–93]. Regarding the pregnancy period, a recent systematic review [27] indicated that high UPF consumption in pregnancy, lactation, and infancy had negative repercussions on health in general but

no meta-analysis was performed. To our knowledge, this is the first study with meta-analysis to assess the effect of UPF-rich diet consumption, through unhealthy dietary patterns, Western foods and UPF intake, by pregnant women and perinatal outcomes, and is the most up-to-date and comprehensive systematic review on this topic.

The significant association found between higher maternal consumption of UPF-rich diets and higher risk of GDM is corroborated by previous studies. A meta-analysis of cohort studies showed that the Western dietary pattern, determined by high intakes of red and processed meat, fried foods, and refined grains, could increase the risk of GDM [94]. Quan et al. also showed that consumption of fast food had a positive association with higher GDM risk [95]. Furthermore, diets presenting high amount of UPFs are frequently rich in sugars and refined grains products, recognized risk factors for GDM [15], endorsing the results of this meta-analysis. In contrast to our results, Kibret et al. [96] found no association between the Western diet pattern and GDM, which may be due to the inclusion of studies assessing UPF-rich dietary patterns as well as soft drinks intake and processed meats alone in the present GDM meta-analysis.

Another interesting finding was a significant association between UPF-rich diets consumption and preeclampsia. A previous recent study with meta-analysis investigated the effects of maternal dietary patterns on pregnancy and reported that maternal adherence to an unhealthy diet was associated with 23% higher odds of HDP, including preeclampsia [97]. Another study also found a significant association between higher adherence to a Western dietary pattern, an unhealthy diet pattern characterized by a high amount of UPF such as processed meat, soft drinks, and refined foods, and increased risk of preeclampsia [98], corroborating our results.

Although the causes of preeclampsia are multifactorial, some risk factors are associated with the development of HDP, such as women experiencing their first pregnancy, twin pregnancy, chronic hypertension, GDM, maternal obesity, and maternal age over 35 years. In addition, healthy lifestyle habits before and during pregnancy can influence the severity of the outcomes [99]. UPFs are rich in sodium, free or added sugars, saturated and trans fats, high energy density, and low in fiber, potassium, and micronutrients [15]. In this context, maternal diet quality has clinical significance given the established association of preeclampsia with maternal and fetal complications such as maternal mortality, perinatal deaths, preterm birth, and intrauterine growth restriction. Moreover, pregnant women affected by HDP have a higher risk of cardiovascular disease in later life, regardless of other risk factors [100,101].

Despite the lack of significant association between UPF-rich diets consumption and excessive GWG, evidence indicates that GWG is significantly correlated with maternal energy intake [102–104]. A recent systematic review reported that dietary patterns with ultra-processed components rich in fat and sugars presented an association with higher GWG [89]. Sartorelli et al. [23] also showed that women classified into the highest tertile of UPFs intake had a three times higher chance of obesity when compared to women with the lowest intake of these foods. Thus, monitoring this trend in pregnant women should be an important healthcare concern objective since excessive GWG is associated with greater chances of hypertensive disorders, cesarean delivery, and LGA newborns [105–107], and a strong predictor of postpartum weight retention, contributing to obesity in later life [108,109].

The development of GDM and preeclampsia could be related to the low nutritional quality of the UFP-rich diet. The low quality of carbohydrates found in UPFs may impair glycemic control [110], especially from the second trimester when anti-insulin hormones, such as estrogens, progesterone, and chorionic somatomammotropin, act by decreasing the power of insulin action, making more glucose available in the bloodstream [111]. The risk of pregnancy complications such as preeclampsia has been linked with maternal oxidative stress in the middle of pregnancy [112]. The findings of a multicenter study showed that oxidative stress could be reduced by sufficient intakes of fruit, vegetables, and vitamin C [113], and Pistollato et al. (2015) reported a lower likelihood of pregnancy-

induced hypertension or preeclampsia when the diet pattern comprised intake of plant-derived foodstuffs and vegetables [114]. Thus, higher UPFs intake may impact and reduce consumption of antioxidants and foment oxidative stress status during pregnancy.

Regarding neonatal outcomes, the present meta-analysis showed no association between maternal UPF-rich diet consumption and neonatal birth outcomes such as birth weight and preterm birth. Endorsing our results, a study with a meta-analysis conducted by Abdollahi et al. [97] showed no association between an unhealthy pattern and birth weight. Kibret et al. [96] also found that a dietary pattern rich in UPF, a Western dietary pattern, did not increase the odds of preterm birth, corroborating our findings.

Nonetheless, the importance of maternal diet in early pregnancy for neonatal health is well documented. Birth weight is an important parameter for assessing newborn health conditions and development, and also is used as one of the basic indicators in the global reference list of the World Health Organization (WHO) [115]. In a meta-analysis conducted with observational studies, Chia et al. [26] reported that unhealthy dietary patterns, characterized by high intakes of refined grains, processed meat, and foods high in saturated fat or sugar, were associated with lower birth weight and a trend towards a higher risk of preterm birth. The study of Rohatgi et al. [4] reported that higher maternal UPF consumption was associated with increased adiposity in the neonate. Taken together, the evidence suggests that maternal diet quality, including UPF consumption, might affect neonatal health.

The etiology of preterm birth is still not well understood, and most cases do not have clear determinants. Some studies reported greater chances of preterm birth observed in pregnant women with high consumption of highly processed foods high in fat and sugar, while the consumption of a healthy diet, rich in fruits, vegetables, and whole grains, appeared to significantly reduce the risk [22,55,83]. Moreover, a meta-analysis of nine cohort studies indicated that higher adherence to a healthy dietary pattern significantly decreased the odds of preterm birth [96].

The results of the present study indicate important public health implications, since higher UPF consumption may worsen perinatal health outcomes. The positive association between UPF-rich diet consumption and GDM and preeclampsia suggests that the consumption of diets rich in UPFs, such as those with high factor loadings for fast foods, junk foods, processed meats, soft drinks, pizzas, hamburgers, candies and sweets, should be discouraged during pregnancy whereas increasing the proportion of in natura and minimally processed food in the diet should be reinforced. Furthermore, prioritizing a healthy lifestyle, which considers adequate food intake, regular physical exercise, regular sleep, and adequate gestational weight gain is mandatory for this population group. This study provides insights to guide policies on pregnancy healthcare as well as nutritional interventions in prenatal services. Further studies with robust methodological quality, such as larger samples and using a more accurate dietary assessment instrument, are needed to clarify the findings on this topic.

The NOVA food categorization classifies foods and beverages "according to the extent and purpose of industrial processing" and defines UPF as "formulations of ingredients, most of exclusive industrial use, that result from a series of industrial processes" (hence "ultra-processed") [10]. Considering that unhealthy dietary patterns, such as Western and Prudent diets, are characterized by a high consumption of UPF, we speculate that our results provide an effort to measure the UPF consumption association with perinatal outcomes, since diet is a modifiable risk factor. This study has several strengths. To date, this is the first study conducted with a meta-analysis on the topic. A comprehensive search strategy was carried out using a robust and appropriate methodology according to Cochrane Handbook and PRISMA guidelines. Moreover, many subjects were included for each pooled outcome, increasing the generalizability of the results. In addition, the methodological quality of the included studies was assessed independently, and the GRADE system was used to assess the certainty of the evidence of each exposure–outcome association. Despite the few studies in the pregnancy group

specifically evaluating UPFs intake, out of the 61 studies included in the review, 83% found a significant association between UPF-rich diets consumption and adverse health outcomes. These data demonstrate the important impact on public health in the maternal and child group and may support future nutritional recommendations for these populations.

Some limitations are also noteworthy. First, the study did not exclusively evaluate UPF consumption, but we speculate that unhealthy and Western dietary patterns may be considered as a proxy for UPF intake. Second, applied dietary assessments of the included studies were not specifically designed for the NOVA classification system. Third, high heterogeneity between studies was observed in many analyses considering the nature of the observational nutritional studies. This is expected because of the diverse characteristics of subjects, the different dietary approaches, and the variance between outcome assessment methods. Fourth, the lack of significant results in perinatal outcomes may be due to the small number of included articles for each outcome, thus it was not possible to perform subgroups analysis to seek the source of heterogeneity. Lastly, publication bias was observed, so, studies that had negative results might not have been submitted for publication and were not included.

Finally, maternal nutrition for successful pregnancy outcomes cannot be addressed during pregnancy alone. A varied diet rich in protein sources, fruit, and vegetables should be consumed by women who intend to become pregnant and during pregnancy as a component of prenatal care. The results presented here suggest that nutritional recommendations should focus not only on foods and nutrients amounts but also on the degree of food processing.

5. Conclusions

This study indicates a positive association between maternal UPF-rich diet consumption during pregnancy and increased risk of developing gestational diabetes mellitus and preeclampsia. These findings corroborate the adverse effects of consumption of diets rich in UPF during pregnancy and highlight the need to monitor and reduce UPF-rich diet consumption specifically during the gestational period, as a strategy to prevent adverse perinatal outcomes.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/nu14153242/s1, Table S1: PECOS acronym used in the design of the study; Table S2: Database search strategies; Table S3: reasons for exclusion of articles; Table S4: risk of bias of cohort studies; Table S5: risk of bias of cross-sectional studies; Table S6: risk of bias of case-control studies; Figure S1: Publication bias funnel graph for UPF consumption and Gestational Diabetes Mellitus risk.

Author Contributions: Conceptualization, W.O.P., E.S.O.P., V.S.S.G. and N.P.; methodology, W.O.P., E.S.O.P. and V.S.S.G.; conducting the systematic literature search W.O.P. and E.S.O.P.; performed the data extraction and quality assessment, W.O.P. and E.S.O.P.; formal analysis, V.S.S.G.; writing—original draft preparation, W.O.P.; writing—review and editing, E.S.O.P., V.S.S.G. and N.P.; supervision, N.P. All authors have read and agreed to the published version of the manuscript.

Funding: DPG/DPI/University of Brasilia and PPGNH/UnB;

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Soma-Pillay, P.; Nelson-Piercy, C.; Tolppanen, H.; Mebazaa, A. Physiological Changes in Pregnancy. *Cardiovasc. J. Afr.* **2016**, *27*, 89–94. https://doi.org/10.5830/CVJA-2016-021.
2. WHO. *Good Maternal Nutrition: The Best Start in Life*; WHO Regional Office for Europe: Copenhagen, Denmark, 2016; ISBN 9789289051545.
3. Mendonça, E.L.S.S.; de Lima Macêna, M.; Bueno, N.B.; de Oliveira, A.C.M.; Mello, C.S. Premature Birth, Low Birth Weight, Small for Gestational Age and Chronic Non-Communicable Diseases in Adult Life: A Systematic Review with Meta-Analysis. *Early Hum. Dev.* **2020**, *149*, 105154. https://doi.org/10.1016/j.earlhumdev.2020.105154.
4. Rohatgi, K.W.; Tinius, R.A.; Cade, W.T.; Steele, E.M.; Cahill, A.G.; Parra, D.C. Relationships between Consumption of Ultra-Processed Foods, Gestational Weight Gain and Neonatal Outcomes in a Sample of US Pregnant Women. *PeerJ* **2017**, *2017*, e4091–e4091. https://doi.org/10.7717/peerj.4091.
5. Deierlein, A.L.; Ghassabian, A.; Kahn, L.G.; Afanasyeva, Y.; Mehta-Lee, S.S.; Brubaker, S.G.; Trasande, L. Dietary Quality and Sociodemographic and Health Behavior Characteristics Among Pregnant Women Participating in the New York University Children's Health and Environment Study. *Front. Nutr.* **2021**, *8*, 639425. https://doi.org/10.3389/fnut.2021.639425.
6. Rojhani, A.; Ouyang, P.; Gullon-Rivera, A.; Dale, T.M. Dietary Quality of Pregnant Women Participating in the Special Supplemental Nutrition Program for Women, Infants, and Children. *Int. J. Environ. Res. Public Health* **2021**, *18*, 8370 https://doi.org/10.3390/ijerph18168370.
7. Leone, A.; Martínez-González, M.Á.; Craig, W.; Fresán, U.; Gómez-Donoso, C.; Bes-Rastrollo, M. Pre-Gestational Consumption of Ultra-Processed Foods and Risk of Gestational Diabetes in a Mediterranean Cohort. The SUN Project. *Nutrients* **2021**, *13*, 2202. https://doi.org/10.3390/nu13072202.
8. Monteiro, C.A.; Cannon, G.; Moubarac, J.-C.; Levy, R.B.; Louzada, M.L.C.; Jaime, P.C. The UN Decade of Nutrition, the NOVA Food Classification and the Trouble with Ultra-Processing. *Public Health Nutr.* **2018**, *21*, 5–17. https://doi.org/10.1017/S1368980017000234.
9. Monteiro, C.A.; Levy, R.B.; Claro, R.M.; Castro, I.R.R. de; Cannon, G. A New Classification of Foods Based on the Extent and Purpose of Their Processing. *Cad. Saúde Pública* **2010**, *26*, 2039–2049. https://doi.org/10.1590/s0102-311x2010001100005.
10. Monteiro, C.A.; Cannon, G.; Levy, R.B.; Moubarac, J.C.; Louzada, M.L.C.; Rauber, F.; Khandpur, N.; Cediel, G.; Neri, D.; Martinez-Steele, E.; et al. Ultra-Processed Foods: What They Are and How to Identify Them. *Public Health Nutr.* **2019**, *22*, 936–941.
11. Cordain, L.; Eaton, S.B.; Sebastian, A.; Mann, N.; Lindeberg, S.; Watkins, B.A.; O'Keefe, J.H.; Brand-Miller, J. Origins and Evolution of the Western Diet: Health Implications for the 21st Century. *Am. J. Clin. Nutr.* **2005**, *81*, 341–354. https://doi.org/10.1093/ajcn.81.2.341.
12. Monteiro, C.A.; Moubarac, J.C.; Cannon, G.; Ng, S.W.; Popkin, B. Ultra-Processed Products Are Becoming Dominant in the Global Food System. *Obes. Rev.* **2013**, *14*, 21–28.
13. Juul, F.; Parekh, N.; Martinez-Steele, E.; Monteiro, C.A.; Chang, V.W. Ultra-Processed Food Consumption among US Adults from 2001 to 2018. *Am. J. Clin. Nutr.* **2022**, *115*, 211–221. https://doi.org/10.1093/ajcn/nqab305.
14. Rauber, F.; Louzada, M.L.D.C.; Martinez Steele, E.; De Rezende, L.F.M.; Millett, C.; Monteiro, C.A.; Levy, R.B. Ultra-Processed Foods and Excessive Free Sugar Intake in the UK: A Nationally Representative Cross-Sectional Study. *BMJ Open* **2019**, *9*, e027546. https://doi.org/10.1136/bmjopen-2018-027546.
15. Monteiro, C.A.; Cannon, G.; Lawrence, M.; Costa Louzada, M.L.; Pereira Machado, P. *Ultra-Processed Foods, Diet Quality, and Health Using the NOVA Classification System*; FAO: Rome, Italy, 2019; ISBN 978-92-5-131701-3.
16. Baker, P.; Friel, S. Food Systems Transformations, Ultra-Processed Food Markets and the Nutrition Transition in Asia. *Glob. Health* **2016**, *12*, 80. https://doi.org/10.1186/s12992-016-0223-3.
17. Martini, D.; Godos, J.; Bonaccio, M.; Vitaglione, P.; Grosso, G. Ultra-Processed Foods and Nutritional Dietary Profile: A Meta-Analysis of Nationally Representative Samples. *Nutrients* **2021**, *13*, 3390. https://doi.org/10.3390/nu13103390.
18. Gomes, C.D.B.; Malta, M.B.; Benício, M.H.D.A.; Carvalhaes, M.A.D.B.L. Consumption of Ultra-Processed Foods in the Third Gestational Trimester and Increased Weight Gain: A Brazilian Cohort Study. *Public Health Nutr.* **2020**, *24*, 3304–3312. https://doi.org/10.1017/S1368980020001883.
19. Lamyian, M.; Hosseinpour-Niazi, S.; Mirmiran, P.; Banaem, L.M.; Goshtasebi, A.; Azizi, F. Pre-Pregnancy Fast Food Consumption Is Associated with Gestational Diabetes Mellitus among Tehranian Women. *Nutrients* **2017**, *9*, 216. https://doi.org/10.3390/nu9030216.
20. Ikem, E.; Halldorsson, T.I.; Birgisdóttir, B.E.; Rasmussen, M.A.; Olsen, S.F.; Maslova, E. Dietary Patterns and the Risk of Pregnancy-Associated Hypertension in the Danish National Birth Cohort: A Prospective Longitudinal Study. *BJOG Int. J. Obstet. Gynaecol.* **2019**, *126*, 663–673. https://doi.org/10.1111/1471-0528.15593.
21. Amezcua-Prieto, C.; Martínez-Galiano, J.M.; Cano-Ibáñez, N.; Olmedo-Requena, R.; Bueno-Cavanillas, A.; Delgado-Rodríguez, M. Types of Carbohydrates Intake during Pregnancy and Frequency of a Small for Gestational Age Newborn: A Case-Control Study. *Nutrients* **2019**, *11*, 523. https://doi.org/10.3390/nu11030523.
22. Grieger, J.A.; Grzeskowiak, L.E.; Clifton, V.L. Preconception Dietary Patterns in Human Pregnancies Are Associated with Preterm Delivery. *J. Nutr.* **2014**, *144*, 1075–1080. https://doi.org/10.3945/jn.114.190686.
23. Sartorelli, D.S.; Crivellenti, L.C.; Zuccolotto, D.C.C.; Franco, L.J. Relationship between Minimally and Ultra-Processed Food Intake during Pregnancy with Obesity and Gestational Diabetes Mellitus. *Cad. Saúde Publica* **2019**, *35*, e00049318. https://doi.org/10.1590/0102-311X00049318.
24. Miranda, C.; Souza, R.C.V.e.; Santos, L.C. Dos Influência Do Consumo de Alimentos Ultraprocessados Durante a Gestação Nas Medidas Antropométricas Do Bebê, Do Nascimento Ao Primeiro Ano de Vida: Uma Revisão Sistemática (The Influence of the Consumption of Ultra-Processed Foods During Pregnancy on Anthropometric Measurements of the Baby, From Birth to the First Year of Life: A Systematic Review). *Rev. Bras. Saúde Matern. Infant.* **2021**, *21*, 9–26.
25. Kinshella, M.L.W.; Omar, S.; Scherbinsky, K.; Vidler, M.; Magee, L.A.; Von Dadelszen, P.; Moore, S.E.; Elango, R. Maternal Dietary Patterns and Pregnancy Hypertension in Low—A Nd Middle-Income Countries: A Systematic Review and Meta-Analysis. *Adv. Nutr.* **2021**, *12*, 2387–2400. https://doi.org/10.1093/advances/nmab057.
26. Chia, A.R.; Chen, L.W.; Lai, J.S.; Wong, C.H.; Neelakantan, N.; Van Dam, R.M.; Chong, M.F.F. Maternal Dietary Patterns and Birth Outcomes: A Systematic Review and Meta-Analysis. *Adv. Nutr.* **2019**, *10*, 685–695. https://doi.org/10.1093/advances/nmy123.
27. De Oliveira, P.G.; De Sousa, J.M.; Assunção, D.G.F.; de Araujo, E.K.S.; Bezerra, D.S.; dos Dametto, J.F.S.; da Ribeiro, K.D.S. Impacts of Consumption of Ultra-Processed Foods on the Maternal-Child Health: A Systematic Review. *Front. Nutr.* **2022**, *9*, 821657. https://doi.org/10.3389/fnut.2022.821657.

28. Arabin, B.; Baschat, A.A. Pregnancy: An Underutilized Window of Opportunity to Improve Long-Term Maternal and Infant Health—An Appeal for Continuous Family Care and Interdisciplinary Communication. *Front. Pediatr.* **2017**, *5*, 69. https://doi.org/10.3389/fped.2017.00069.
29. Page, M.J.; McKenzie, J.E.; Bossuyt, P.M.; Boutron, I.; Hoffmann, T.C.; Mulrow, C.D.; Shamseer, L.; Tetzlaff, J.M.; Akl, E.A.; Brennan, S.E.; et al. The PRISMA 2020 Statement: An Updated Guideline for Reporting Systematic Reviews. *PLoS Med.* **2021**, *18*, e1003583. https://doi.org/10.1371/JOURNAL.PMED.1003583.
30. McGowan, J.; Sampson, M.; Salzwedel, D.M.; Cogo, E.; Foerster, V.; Lefebvre, C. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. *J. Clin. Epidemiol.* **2016**, *75*, 40–46. https://doi.org/10.1016/j.jclinepi.2016.01.021.
31. Moola, S.; Munn, Z.; Tufanaru, C.; Aromataris, E.; Sears, K.; Sfetcu, R.; Currie, M.; Qureshi, R.; Mattis, P.; Lisy, K.; et al. Systematic Reviews of Etiology and Risk. In *JBI Manual for Evidence Synthesis*; Aromataris E., Munn Z., Eds.; Available online: https://synthesismanual.jbi.global (accessed on 13 May 2022).
32. Zhang, J.; Yu, K.F. Special Communication What's the Relative Risk? A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes. *JAMA* **1998**, *280*, 1690–1691.
33. Deeks, J.J.; Higgins, J.P.T.; Altman, D.G. (Eds.) Analysing Data and Undertaking Meta-Analyses. In *Cochrane Handbook for Systematic Reviews of Interventions*; Higgins, J.P.T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M.J., Welch, V.A., Eds.; Wiley: Hoboken, NJ, USA, 2022.
34. Schünemann, H.; Brożek, J.; Guyatt, G.; Oxman, A. Quality of Evidence. In *GRADE Handbook*; Schünemann, H., Brożek, J., Guyatt, G., Oxman, A., Eds.; GRADE Working Group: Barcelona, Spain, 2013.
35. Chen, X.; Ding, Y.; Shi, L.; Wu, D.; Wang, L.; Chen, F.; Mo, Y. Dietary Patterns and Gestational Hypertension in Nulliparous Pregnant Chinese Women: A CONSORT Report. *Medicine* **2020**, *99*, e20186. https://doi.org/10.1097/MD.0000000000020186.
36. Itani, L.; Radwan, H.; Hashim, M.; Hasan, H.; Obaid, R.S.; Al Ghazal, H.; Al Hilali, M.; Rayess, R.; Mohamed, H.J.J.; Hamadeh, R.; et al. Dietary Patterns and Their Associations with Gestational Weight Gain in the United Arab Emirates: Results from the MISC Cohort. *Nutr. J.* **2020**, *19*, 36. https://doi.org/10.1186/s12937-020-00553-9.
37. Abbasi, R.; Bakhshimoghaddam, F.; Alizadeh, M. Major Dietary Patterns in Relation to Preeclampsia among Iranian Pregnant Women: A Case–Control Study. *J. Matern. Neonatal Med.* **2019**, *34*, 3529–3536. https://doi.org/10.1080/14767058.2019.1686474.
38. Asadi, M.; Shahzeidi, M.; Nadjarzadeh, A.; Hashemi Yusefabad, H.; Mansoori, A. The Relationship between Pre-Pregnancy Dietary Patterns Adherence and Risk of Gestational Diabetes Mellitus in Iran: A Case–Control Study. *Nutr. Diet.* **2019**, *76*, 597–603. https://doi.org/10.1111/1747-0080.12514.
39. Hajianfar, H.; Esmaillzadeh, A.; Feizi, A.; Shahshahan, Z.; Azadbakht, L. The Association between Major Dietary Patterns and Pregnancy-Related Complications. *Arch. Iran. Med.* **2018**, *21*, 443–451.
40. Hajianfar, H.; Esmaillzadeh, A.; Feizi, A.; Shahshahan, Z.; Azadbakht, L. Major Maternal Dietary Patterns during Early Pregnancy and Their Association with Neonatal Anthropometric Measurement. *Biomed Res. Int.* **2018**, *2018*, 4692193. https://doi.org/10.1155/2018/4692193.
41. Sedaghat, F.; Akhoondan, M.; Ehteshami, M.; Aghamohammadi, V.; Ghanei, N.; Mirmiran, P.; Rashidkhani, B. Maternal Dietary Patterns and Gestational Diabetes Risk: A Case-Control Study. *J. Diabetes Res.* **2017**, *2017*, 5173926. https://doi.org/10.1155/2017/5173926.
42. Angali, K.A.; Shahri, P.; Borazjani, F. Maternal Dietary Pattern in Early Pregnancy Is Associated with Gestational Weight Gain and Hyperglycemia: A Cohort Study in South West of Iran. *Diabetes Metab. Syndr. Clin. Res. Rev.* **2020**, *14*, 1711–1717. https://doi.org/10.1016/j.dsx.2020.08.008.
43. Loy, S.L.; Marhazlina, M.; Jan, J.M.H. Association between Maternal Food Group Intake and Birth Size. *Sains Malays.* **2013**, *42*, 1633–1640.
44. Okubo, H.; Miyake, Y.; Sasaki, S.; Tanaka, K.; Murakami, K.; Hirota, Y.; Osaka, M.; Kanzaki, H.; Kitada, M.; Horikoshi, Y.; et al. Maternal Dietary Patterns in Pregnancy and Fetal Growth in Japan: The Osaka Maternal and Child Health Study. *Br. J. Nutr.* **2012**, *107*, 1526–1533. https://doi.org/10.1017/S0007114511004636.
45. Zareei, S.; Homayounfar, R.; Naghizadeh, M.M.; Ehrampoush, E.; Amiri, Z.; Rahimi, M.; Tahamtani, L. Dietary Pattern in Patients with Preeclampsia in Fasa, Iran. *Shiraz E-Medical J.* **2019**, *20*, e86959. https://doi.org/10.5812/semj.86959.
46. Ker, C.R.; Wu, C.H.; Lee, C.H.; Wang, S.H.; Chan, T.F. Increased Sugar-Sweetened Beverage Use Tendency in Pregnancy Positively Associates with Peripartum Edinburgh Postpartum Depression Scores. *Sci. Rep.* **2021**, *11*, 15324. https://doi.org/10.1038/s41598-021-94790-5.
47. Liu, Y.; Zhang, H.; Zhao, Y.; Chen, F.; Mi, B.; Zhou, J.; Chen, Y.; Wang, D.; Pei, L. Geographical Variations in Maternal Dietary Patterns during Pregnancy Associated with Birth Weight in Shaanxi Province, Northwestern China. *PLoS ONE* **2021**, *16*, e0254891. https://doi.org/10.1371/journal.pone.0254891.
48. Tamada, H.; Ebara, T.; Matsuki, T.; Kato, S.; Sato, H.; Ito, Y.; Saitoh, S.; Kamijima, M.; Sugiura-Ogasawara, M.; Group, J.E. and C.S. Ready-Meal Consumption During Pregnancy Is a Risk Factor for Stillbirth: The Japan Environment and Children's Study (JECS). *SSRN Electron. J.* **2021**, *14*, 895. https://doi.org/10.2139/ssrn.3866549.
49. Yong, H.Y.; Shariff, Z.M.; Yusof, B.N.M.; Rejali, Z.; Tee, Y.Y.S.; Bindels, J.; van der Beek, E.M. Beverage Intake and the Risk of Gestational Diabetes Mellitus: The SECOST. *Nutrients* **2021**, *13*, 2208. https://doi.org/10.3390/nu13072208.
50. Mitku, A.A.; Zewotir, T.; North, D.; Jeena, P.; Naidoo, R.N. The Differential Effect of Maternal Dietary Patterns on Quantiles of Birthweight. *BMC Public Health* **2020**, *20*, 976. https://doi.org/10.1186/s12889-020-09065-x.
51. Wrottesley, S.V.; Pisa, P.T.; Norris, S.A. The Influence of Maternal Dietary Patterns on Body Mass Index and Gestational Weight Gain in Urban Black South African Women. *Nutrients* **2017**, *9*, 732. https://doi.org/10.3390/nu9070732.
52. Barbosa, J.M.A.; da Silva, A.A.M.; Kac, G.; Simões, V.M.F.; Bettiol, H.; Cavalli, R.C.; Barbieri, M.A.; Ribeiro, C.C.C. Is Soft Drink Consumption Associated with Gestational Hypertension? Results from the Brisa Cohort. *Braz. J. Med. Biol. Res.* **2021**, *54*, e10162. https://doi.org/10.1590/1414-431x202010162.
53. Ancira-Moreno, M.; O'Neill, M.S.; Rivera-Dommarco, J.Á.; Batis, C.; Rodríguez Ramírez, S.; Sánchez, B.N.; Castillo-Castrejón, M.; Vadillo-Ortega, F. Dietary Patterns and Diet Quality during Pregnancy and Low Birthweight: The PRINCESA Cohort. *Matern. Child Nutr.* **2020**, *16*, e12972. https://doi.org/10.1111/mcn.12972.
54. Alves-Santos, N.H.; Cocate, P.G.; Benaim, C.; Farias, D.R.; Emmett, P.M.; Kac, G. Prepregnancy Dietary Patterns and Their Association with Perinatal Outcomes: A Prospective Cohort Study. *J. Acad. Nutr. Diet.* **2019**, *119*, 1439–1451. https://doi.org/10.1016/j.jand.2019.02.016.
55. Martin, C.L.; Sotres-Alvarez, D.; Siega-Riz, A.M. Maternal Dietary Patterns during the Second Trimester Are Associated with Preterm Birth. *J. Nutr.* **2015**, *145*, 1857–1864. https://doi.org/10.3945/jn.115.212019.

56. Chen, L.; Hu, F.B.; Yeung, E.; Willett, W.; Zhang, C. Prospective Study of Pre-Gravid Sugar-Sweetened Beverage Consumption and the Risk of Gestational Diabetes Mellitus. *Diabetes Care* **2009**, *32*, 2236–2241. https://doi.org/10.2337/dc09-0866.
57. Zhang, C.; Schulze, M.B.; Solomon, C.G.; Hu, F.B. A Prospective Study of Dietary Patterns, Meat Intake and the Risk of Gestational Diabetes Mellitus. *Diabetologia* **2006**, *49*, 2604–2613. https://doi.org/10.1007/s00125-006-0422-1.
58. Hirko, K.A.; Comstock, S.S.; Strakovsky, R.S.; Kerver, J.M. Diet during Pregnancy and Gestational Weight Gain in a Michigan Pregnancy Cohort. *Curr. Dev. Nutr.* **2020**, *4,* nzaa121. https://doi.org/10.1093/cdn/nzaa121.
59. Martin, C.L.; Siega-Riz, A.M.; Sotres-Alvarez, D.; Robinson, W.R.; Daniels, J.L.; Perrin, E.M.; Stuebe, A.M. Maternal Dietary Patterns during Pregnancy Are Associated with Child Growth in the First 3 Years of Life. *J. Nutr.* **2016**, *146*, 2281–2288. https://doi.org/10.3945/jn.116.234336.
60. Teixeira, J.A.; Hoffman, D.J.; Castro, T.G.; Saldiva, S.R.D.M.; Francisco, R.P. V.; Vieira, S.E.; Marchioni, Di.M. Pre-Pregnancy Dietary Pattern Is Associated with Newborn Size: Results from ProcriAr Study. *Br. J. Nutr.* **2021**, *126*, 903–912. https://doi.org/10.1017/S0007114520004778.
61. Zuccolotto, D.C.C.; Crivellenti, lívia C.; Franco, L.J.; Sarotelli, D.S. Padrões Alimentares de Gestantes, Excesso de Peso Materno e Diabetes Gestacional (Dietary Patterns of Pregnant Women, Excessive Maternal Weight and Gestational Diabetes). *Rev. Saúde Publica* **2019**, *53*, 52.
62. Nascimento, G.R.; Alves, L.V.; Fonseca, C.L.; Figueiroa, J.N.; Alves, J.G. Dietary Patterns and Gestational Diabetes Mellitus in a Low Income Pregnant Women Population in Brazil—A Cohort Study. *Arch. Latinoam. Nutr.* **2016**, *66*, 301–308.
63. De Coelho, N.L.P.; Cunha, D.B.; Esteves, A.P.P.; de Lacerda, É.M.A.; Filha, M.M.T. Dietary Patterns in Pregnancy and Birth Weight. *Rev. Saúde Publica* **2015**, *49*, 1–10. https://doi.org/10.1590/S0034-8910.2015049005403.
64. Marquez, B.V.Y. *Association between Sugar-Sweetened Beverages and Both Gestational Weight Gain and Gestational Diabetes*; The University of Texas School of Public Health: Dallas, TX, USA, 2012.
65. Rodrigues, B.; Azeredo, V.; Silva, A. Relationship between Food Consumption of Pregnant Women and Birth Weight of Newborns. *Rev. Chil. Nutr.* **2020**, *47*, 80–88. https://doi.org/10.4067/S0717-75182020000100080.
66. Günther, J.; Hoffmann, J.; Spies, M.; Meyer, D.; Kunath, J.; Stecher, L.; Rosenfeld, E.; Kick, L.; Rauh, K.; Hauner, H. Associations between the Prenatal Diet and Neonatal Outcomes—A Secondary Analysis of the Cluster-Randomised Gelis Trial. *Nutrients* **2019**, *11*, 1889. https://doi.org/10.3390/nu11081889.
67. Maugeri, A.; Barchitta, M.; Favara, G.; La Rosa, M.C.; La Mastra, C.; Magnano San Lio, R.; Agodi, A. Maternal Dietary Patterns Are Associated with Pre-Pregnancy Body Mass Index and Gestational Weight Gain: Results from the "Mamma & Bambino" Cohort. *Nutrients* **2019**, *11*, 1308. https://doi.org/10.3390/nu11061308.
68. Englund-Ögge, L.; Brantsæter, A.L.; Juodakis, J.; Haugen, M.; Meltzer, H.M.; Jacobsson, B.; Sengpiel, V. Associations between Maternal Dietary Patterns and Infant Birth Weight, Small and Large for Gestational Age in the Norwegian Mother and Child Cohort Study. *Eur. J. Clin. Nutr.* **2019**, *73*, 1270–1282. https://doi.org/10.1038/s41430-018-0356-y.
69. Marí-Sanchis, A.; Díaz-Jurado, G.; Basterra-Gortari, F.J.; de la Fuente-Arrillaga, C.; Martínez-González, M.A.; Bes-Rastrollo, M. Association between Pre-Pregnancy Consumption of Meat, Iron Intake, and the Risk of Gestational Diabetes: The SUN Project. *Eur. J. Nutr.* **2018**, *57*, 939–949. https://doi.org/10.1007/s00394-017-1377-3.
70. Schmidt, A.B.; Lund, M.; Corn, G.; Halldorsson, T.I.; Øyen, N.; Wohlfahrt, J.; Olsen, S.F.; Melbye, M. Dietary Glycemic Index and Glycemic Load during Pregnancy and Offspring Risk of Congenital Heart Defects: A Prospective Cohort Study. *Am. J. Clin. Nutr.* **2020**, *111*, 526–535. https://doi.org/10.1093/ajcn/nqz342.
71. Donazar-Ezcurra, M.; Lopez-Del Burgo, C.; Martinez-Gonzalez, M.A.; Basterra-Gortari, F.J.; De Irala, J.; Bes-Rastrollo, M. Pre-Pregnancy Adherences to Empirically Derived Dietary Patterns and Gestational Diabetes Risk in a Mediterranean Cohort: The Seguimiento Universidad de Navarra (SUN) Project. *Br. J. Nutr.* **2017**, *118*, 715–721. https://doi.org/10.1017/S0007114517002537.
72. Donazar-Ezcurra, M.; Lopez-del Burgo, C.; Martinez-Gonzalez, M.A.; Basterra-Gortari, F.J.; de Irala, J.; Bes-Rastrollo, M. Soft Drink Consumption and Gestational Diabetes Risk in the SUN Project. *Clin. Nutr.* **2017**, *37*, 638–645. https://doi.org/10.1016/j.clnu.2017.02.0 05.
73. Grundt, J.H.; Eide, G.E.; Brantsæter, A.L.; Haugen, M.; Markestad, T. Is Consumption of Sugar-Sweetened Soft Drinks during Pregnancy Associated with Birth Weight? *Matern. Child Nutr.* **2016**, *13*, e12405. https://doi.org/10.1111/mcn.12405.
74. Dominguez, L.J.; Martínez-González, M.A.; Basterra-Gortari, F.J.; Gea, A.; Barbagallo, M.; Bes-Rastrollo, M. Fast Food Consumption and Gestational Diabetes Incidence in the SUN Project. *PLoS ONE* **2014**, *9*, e106627. https://doi.org/10.1371/journal.pone.0106627.
75. Borgen, I.; Aamodt, G.; Harsem, N.; Haugen, M.; Meltzer, H.M.; Brantsæter, A.L. Maternal Sugar Consumption and Risk of Preeclampsia in Nulliparous Norwegian Women. *Eur. J. Clin. Nutr.* **2012**, *66*, 920–925. https://doi.org/10.1038/ejcn.2012.61.
76. Brantsæter, A.L.; Haugen, M.; Samuelsen, S.O.; Torjusen, H.; Trogstad, L.; Alexander, J.; Magnus, P.; Meltzer, H.M. A Dietary Pattern Characterized by High Intake of Vegetables, Fruits, and Vegetable Oils Is Associated with Reduced Risk of Preeclampsia in Nulliparous Pregnant Norwegian Women. *J. Nutr.* **2009**, *139*, 1162–1168. https://doi.org/10.3945/jn.109.104968.
77. Uusitalo, U.; Arkkola, T.; Ovaskainen, M.L.; Kronberg-Kippilä, C.; Kenward, M.G.; Veijola, R.; Simell, O.; Knip, M.; Virtanen, S.M. Unhealthy Dietary Patterns Are Associated with Weight Gain during Pregnancy among Finnish Women. *Public Health Nutr.* **2009**, *12*, 2392–2399. https://doi.org/10.1017/S136898000900528X.
78. Nicolì, F.; Prete, A.; Citro, F.; Bertolotto, A.; Aragona, M.; de Gennaro, G.; Del Prato, S.; Bianchi, C. Use of Non-Nutritive-Sweetened Soft Drink and Risk of Gestational Diabetes. *Diabetes Res. Clin. Pract.* **2021**, *178*, 108943. https://doi.org/10.1016/j.diabres.2021.108943.
79. Dale, M.T.G.; Magnus, P.; Leirgul, E.; Holmstrøm, H.; Gjessing, H.K.; Brodwall, K.; Haugen, M.; Stoltenberg, C.; Øyen, N. Intake of Sucrose-Sweetened Soft Beverages during Pregnancy and Risk of Congenital Heart Defects (CHD) in Offspring: A Norwegian Pregnancy Cohort Study. *Eur. J. Epidemiol.* **2019**, *34*, 383–396. https://doi.org/10.1007/s10654-019-00480-y.
80. Garay, S.M.; Savory, K.A.; Sumption, L.; Penketh, R.; Janssen, A.B.; John, R.M. The Grown in Wales Study: Examining Dietary Patterns, Custom Birthweight Centiles and the Risk of Delivering a Small-for-Gestational Age (SGA) Infant. *PLoS ONE* **2019**, *14*, e0213412. https://doi.org/10.1371/journal.pone.0213412.
81. Tielemans, M.J.; Erler, N.S.; Leermakers, E.T.M.; van den Broek, M.; Jaddoe, V.W.V.; Steegers, E.A.P.; Kiefte-de Jong, J.C.; Franco, O.H. A Priori and a Posteriori Dietary Patterns during Pregnancy and Gestational Weight Gain: The Generation R Study. *Nutrients* **2015**, *7*, 9383–9399. https://doi.org/10.3390/nu7115476.
82. Zhu, Y.; Olsen, S.F.; Mendola, P.; Halldorsson, T.I.; Rawal, S.; Hinkle, S.N.; Yeung, E.H.; Chavarro, J.E.; Grunnet, L.G.; Granström, C.; et al. Maternal Consumption of Artificially Sweetened Beverages during Pregnancy, and Offspring Growth through 7 Years of Age: A Prospective Cohort Study. *Int. J. Epidemiol.* **2017**, *46*, 1499–1508. https://doi.org/10.1093/ije/dyx095.

83. Rasmussen, M.A.; Maslova, E.; Halldorsson, T.I.; Olsen, S.F. Characterization of Dietary Patterns in the Danish National Birth Cohort in Relation to Preterm Birth. *PLoS ONE* **2014**, *9*, e93644. https://doi.org/10.1371/journal.pone.0093644.
84. Bärebring, L.; Brembeck, P.; Löf, M.; Brekke, H.K.; Winkvist, A.; Augustin, H. Food Intake and Gestational Weight Gain in Swedish Women. *SpringerPlus* **2016**, *5*, 377. https://doi.org/10.1186/s40064-016-2015-x.
85. Englund-Ögge, L.; Brantsæter, A.L.; Sengpiel, V.; Haugen, M.; Birgisdottir, B.E.; Myhre, R.; Meltzer, H.M.; Jacobsson, B. Maternal Dietary Patterns and Preterm Delivery: Results from Large Prospective Cohort Study. *BMJ* **2014**, *348*, g1446–g1446. https://doi.org/10.1136/bmj.g1446.
86. Mikeš, O.; Brantsæter, A.L.; Knutsen, H.K.; Torheim, L.E.; Bienertová Vašků, J.; Pruša, T.; Čupr, P.; Janák, K.; Dušek, L.; Klánová, J. Dietary Patterns and Birth Outcomes in the ELSPAC Pregnancy Cohort. *J. Epidemiol. Community Health* **2021**, *76*, 613–619. https://doi.org/10.1136/jech-2020-215716.
87. Wen, L.M.; Simpson, J.M.; Rissel, C.; Baur, L.A. Maternal "Junk Food" Diet During Pregnancy as a Predictor of High Birthweight: Findings from the Healthy Beginnings Trial. *Birth* **2013**, *40*, 46–51. https://doi.org/10.1111/birt.12028.
88. Baskin, R.; Hill, B.; Jacka, F.N.; O'Neil, A.; Skouteris, H. Antenatal Dietary Patterns and Depressive Symptoms during Pregnancy and Early Post-Partum. *Matern. Child Nutr.* **2017**, *13*, e12218. https://doi.org/10.1111/mcn.12218.
89. Ferreira, L.B.; Lobo, C.V.; do Carmo, A.S.; Souza, R.C.V.E.; Dos Santos, L.C. Dietary Patterns During Pregnancy and Their Association with Gestational Weight Gain and Anthropometric Measurements at Birth. *Matern. Child Health J.* **2022**, *26*, 1464–1472. https://doi.org/10.1007/s10995-022-03392-8.
90. De Silva, C.O.; de Souza, J.Diet during Pregnancy: Ultra-Processed Foods and the Inflammatory Potential of Diet. *Nutrition* **2022**, *97*, 111603.
91. Pagliai, G.; Dinu, M.; Madarena, M.P.; Bonaccio, M.; Iacoviello, L.; Sofi, F. Consumption of Ultra-Processed Foods and Health Status: A Systematic Review and Meta-Analysis. *Br. J. Nutr.* **2021**, *125*, 308–318.
92. Chen, X.; Zhang, Z.; Yang, H.; Qiu, P.; Wang, H.; Wang, F.; Zhao, Q.; Fang, J.; Nie, J. Consumption of Ultra-Processed Foods and Health Outcomes: A Systematic Review of Epidemiological Studies. *Nutr. J.* **2020**, *19*, 1–10. https://doi.org/10.1186/s12937-020-00604-1.
93. Barbosa, S.S.; Sousa, L.C.M.; de Oliveira Silva, D.F.; Pimentel, J.B.; de Evangelista, K.C.M.S.; de Lyra, C.O.; Lopes, M.M.G.D.; Lima, S.C.V.C. A Systematic Review on Processed/Ultra-Processed Foods and Arterial Hypertension in Adults and Older People. *Nutrients* **2022**, *14*, 1215. https://doi.org/10.3390/nu14061215.
94. Hassani Zadeh, S.; Boffetta, P.; Hosseinzadeh, M. Dietary Patterns and Risk of Gestational Diabetes Mellitus: A Systematic Review and Meta-Analysis of Cohort Studies. *Clin. Nutr. ESPEN* **2020**, *36*, 1–9. https://doi.org/10.1016/j.clnesp.2020.02.009.
95. Quan, W.; Zeng, M.; Jiao, Y.; Li, Y.; Xue, C.; Liu, G.; Wang, Z.; Qin, F.; He, Z.; Chen, J. Western Dietary Patterns, Foods, and Risk of Gestational Diabetes Mellitus: A Systematic Review and Meta-Analysis of Prospective Cohort Studies. *Adv. Nutr.* **2021**, *12*, 1353–1364. https://doi.org/10.1093/advances/nmaa184.
96. Kibret, K.T.; Chojenta, C.; Gresham, E.; Tegegne, T.K.; Loxton, D. Maternal Dietary Patterns and Risk of Adverse Pregnancy (Hypertensive Disorders of Pregnancy and Gestational Diabetes Mellitus) and Birth (Preterm Birth and Low Birth Weight) Outcomes: A Systematic Review and Meta-Analysis. *Public Health Nutr.* **2019**, *22*, 506–520. https://doi.org/10.1017/S1368980018002616.
97. Abdollahi, S.; Soltani, S.; De Souza, R.J.; Forbes, S.C.; Toupchian, O.; Salehi-Abargouei, A. Associations between Maternal Dietary Patterns and Perinatal Outcomes: A Systematic Review and Meta-Analysis of Cohort Studies. *Adv. Nutr.* **2021**, *12*, 1332–1352. https://doi.org/10.1093/advances/nmaa156.
98. Traore, S.S.; Bo, Y.; Amoah, A.N.; Khatun, P.; Kou, G.; Hu, Y.; Lyu, Q. A Meta-Analysis of Maternal Dietary Patterns and Preeclampsia. *Clin. Nutr. Open Sci.* **2021**, *40*, 15–29. https://doi.org/10.1016/j.nutos.2021.08.001.
99. Rana, S.; Lemoine, E.; Granger, J.; Karumanchi, S.A. Preeclampsia: Pathophysiology, Challenges, and Perspectives. *Circ. Res.* **2019**, *124*, 1094–1112. https://doi.org/10.1161/CIRCRESAHA.118.313276.
100. Garovic, V.D.; Dechend, R.; Easterling, T.; Karumanchi, S.A.; Baird, S.M.M.; Magee, L.A.; Rana, S.; Vermunt, J.V.; August, P. Hypertension in Pregnancy: Diagnosis, Blood Pressure Goals, and Pharmacotherapy: A Scientific Statement From the American Heart Association. *Hypertension* **2022**, *79*, E21–E41.
101. Teng, H.; Wang, Y.; Han, B.; Liu, J.; Cao, Y.; Wang, J.; Zhu, X.; Fu, J.; Ling, Q.; Xiao, C.; et al. Gestational Systolic Blood Pressure Trajectories and Risk of Adverse Maternal and Perinatal Outcomes in Chinese Women. *BMC Pregnancy Childbirth* **2021**, *21*, 155 https://doi.org/10.1186/s12884-021-03599-7.
102. Diemert, A.; Lezius, S.; Pagenkemper, M.; Hansen, G.; Drozdowska, A.; Hecher, K.; Arck, P.; Zyriax, B.C. Maternal Nutrition, Inadequate Gestational Weight Gain and Birth Weight: Results from a Prospective Birth Cohort. *BMC Pregnancy Childbirth* **2016**, *16*, 224. https://doi.org/10.1186/s12884-016-1012-y.
103. Mishra, K.G.; Bhatia, V.; Nayak, R. Maternal Nutrition and Inadequate Gestational Weight Gain in Relation to Birth Weight: Results from a Prospective Cohort Study in India. *Clin. Nutr. Res.* **2020**, *9*, 213. https://doi.org/10.7762/cnr.2020.9.3.213.
104. Lagiou, P.; Tamimi, R.M.; Mucci, L.A.; Adami, H.-O.; Hsieh, C.-C.; Trichopoulos, D. Diet during Pregnancy in Relation to Maternal Weight Gain and Birth Size. *Eur. J. Clin. Nutr.* **2004**, *58*, 231–237. https://doi.org/10.1038/sj.ejcn.1601771.
105. Dude, A.M.; Grobman, W.; Haas, D.; Mercer, B.M.; Parry, S.; Silver, R.M.; Wapner, R.; Wing, D.; Saade, G.; Reddy, U.; et al. Gestational Weight Gain and Pregnancy Outcomes among Nulliparous Women. *Am. J. Perinatol.* **2021**, *38*, 182–190. https://doi.org/10.1055/s-0039-1696640.
106. Sun, Y.; Shen, Z.; Zhan, Y.; Wang, Y.; Ma, S.; Zhang, S.; Liu, J.; Wu, S.; Feng, Y.; Chen, Y.; et al. Effects of Pre-Pregnancy Body Mass Index and Gestational Weight Gain on Maternal and Infant Complications. *BMC Pregnancy Childbirth* **2020**, *20*, 390 https://doi.org/10.1186/s12884-020-03071-y.
107. Mbu, R.E.; Fouedjio, H.J.; Tabot, M.; Fouelifack, F.Y.; Tumasang, F.N.; Tonye, R.N.; Leke, R.J.I. Effects of Gestational Weight Gain on the Outcome of Labor at the Yaounde Central Hospital Maternity, Cameroon. *Open J. Obstet. Gynecol.* **2013**, *03*, 648–652. https://doi.org/10.4236/ojog.2013.39118.
108. Ashley-Martin, J.; Woolcott, C. Gestational Weight Gain and Postpartum Weight Retention in a Cohort of Nova Scotian Women. *Matern. Child Health J.* **2014**, *18*, 1927–1935. https://doi.org/10.1007/s10995-014-1438-7.
109. Widen, E.M.; Whyatt, R.M.; Hoepner, L.A.; Ramirez-Carvey, J.; Oberfield, S.E.; Hassoun, A.; Perera, F.P.; Gallagher, D.; Rundle, A.G. Excessive Gestational Weight Gain Is Associated with Long-Term Body Fat and Weight Retention at 7 y Postpartum in African American and Dominican Mothers with Underweight, Normal, and Overweight Prepregnancy BMI. *Am. J. Clin. Nutr.* **2015**, *102*, 1460–1467. https://doi.org/10.3945/ajcn.115.116939.
110. Shin, D.; Lee, K.W.; Song, W.O. Dietary Patterns during Pregnancy Are Associated with Risk of Gestational Diabetes Mellitus. *Nutrients* **2015**, *7*, 9369–9382. https://doi.org/10.3390/nu7115472.

111. Silva, C.F.M.; Saunders, C.; Peres, W.; Folino, B.; Kamel, T.; dos Santos, M.S.; Padilha, P. Effect of Ultra-Processed Foods Consumption on Glycemic Control and Gestational Weight Gain in Pregnant with Pregestational Diabetes Mellitus Using Carbohydrate Counting. *PeerJ* **2021**, *9*, e10514. https://doi.org/10.7717/peerj.10514.
112. Hsieh, T.-T.; Chen, S.-F.; Lo, L.-M.; Li, M.-J.; Yeh, Y.-L.; Hung, T.-H. The Association Between Maternal Oxidative Stress at Mid-Gestation and Subsequent Pregnancy Complications. *Reprod. Sci.* **2012**, *19*, 505–512. https://doi.org/10.1177/1933719111426601.
113. Kim, H.; Hwang, J.-Y.; Ha, E.-H.; Park, H.; Ha, M.; Lee, S.-H.; Hong, Y.-C.; Chang, N. Fruit and Vegetable Intake Influences the Association between Exposure to Polycyclic Aromatic Hydrocarbons and a Marker of Oxidative Stress in Pregnant Women. *Eur. J. Clin. Nutr.* **2011**, *65*, 1118–1125. https://doi.org/10.1038/ejcn.2011.77.
114. Pistollato, F.; Sumalla Cano, S.; Elio, I.; Masias Vergara, M.; Giampieri, F.; Battino, M. Plant-Based and Plant-Rich Diet Patterns during Gestation: Beneficial Effects and Possible Shortcomings. *Adv. Nutr.* **2015**, *6*, 581–591. https://doi.org/10.3945/an.115.009126.
115. WHO. Low Birth Weight. Available online: https://www.who.int/data/nutrition/nlis/info/low-birth-weight (accessed on 4 March 2022).

International Journal of
Environmental Research and Public Health

MDPI

5.2. Artigo 2: Original

Article

Impact of ultra-processed food consumption on quality of diet among Brazilian pregnant women assisted in Primary Health Care

Walkyria O. Paula[1]; Vivian S. S. Gonçalves[2]; Erika S. O. Patriota[2]; Sylvia C. C. Franceschini[3]; Nathalia Pizato[1*,]

[1] Graduate Program in Human Nutrition, Faculty of Health Sciences, University of Brasilia, Brasilia 70910-900, Brazil
[2] Graduate Program in Public Health, Faculty of Health Sciences, University of Brasilia, Brasilia 70910-900, Brazil
[3] Graduate Program in Nutrition Sciences, Federal University of Viçosa, Viçosa, Brazil; 36570-999
* Correspondence: pizatonat@unb.br

Abstract: The quality of diet and nutritional status during pregnancy are crucial to optimize maternal and fetal health. Ultra-processed foods (UPFs) are increasingly prevalent in pregnancy groups despite being nutritionally unbalanced and associated with adverse perinatal outcomes. This cross-sectional study, conducted with data from 229 pregnant women, aimed to investigate the association between UPFs consumption and dietary nutrient intake of pregnant women assisted by Primary Health Care (PHC) in Federal District (DF), Brazil. Food consumption was assessed through two non-consecutive 24-h food records and categorized by the extent of processing using the NOVA classification. Multivariate linear regression models were used to analyze the association between the quintiles of UPF consumption and the total energy and nutrients intake. Mean daily energy intake was 1741kcal, with 22.6% derived from UPFs. Greater UPF consumption was associated with reduced intake of unprocessed and minimally processed food. The highest quintile of UPFs was positively associated with higher total energy, trans fat and sodium intake; and inversely associated with the diet content of protein, fiber, iron, magnesium, potassium, copper, zinc, selenium, and folate. Greater UPFs intake negatively impacts the nutritional quality of the diet and impoverishes the nutrient intake of pregnant women. Reducing UPF consumption may broadly improve dietary guidelines adherence in pregnant women and promote maternal and neonatal health.

Keywords: ultra-processed food; pregnancy; quality of diet; nutrients; primary health care

Citation: Paula, W.O; Gonçalves, V.S.S.; Patriota, E.S.O.; Franceschini, S.C.C.; Pizato, N. Impact of Ultra-Processed Food Consumption on Quality of Diet among Brazilian Pregnant Women Assisted in Primary Health Care. *Int.J. Environ. Res. Public Health* **2023**, *20*, 1015. https://doi.org/10.3390/ijerph20021015

Academic Editor: Paul B. Tchounwou

Received: 28 November 2022
Revised: 30 December 2022
Accepted: 1 January 2023
Published: 5 January 2023

1. Introduction

During pregnancy, women undergo significant metabolic and physiological changes that include increased nutritional needs in order to achieve proper fetal growth and normal development [1]. It has been well-established that pregnancy increases energy requirements and a woman's need for protein, vitamins, and minerals [2], especially iron, zinc, calcium, iodine, vitamin D, folate, and other B vitamins [3].

Adequate quality of diet and nutritional status during pregnancy are crucial to optimize maternal and fetal health and promote successful pregnancy outcomes [4]. On the other hand, poor maternal diet, lacking in key nutrients, is associated with adverse perinatal outcomes such as maternal anemia, pre-eclampsia, hemorrhage, and increased risk of maternal mortality. It can also lead to stillbirth, inadequate birthweight, miscarriage, and fetal development complications [5]. Thus, it is fundamental to identify modifiable dietary risk factors related to such adverse outcomes of pregnancy.

Higher consumption of diets rich in ultra-processed foods (UPFs) during pregnancy was found to be associated with an increased risk of gestational diabetes mellitus and preeclampsia [6]. Despite the evidence of the relationship between maternal diet and perinatal outcomes, several studies have reported inadequate diet quality during pregnancy, including high consumption of unhealthy foods and UPFs [7–10].

UPFs are one group, in the four-category NOVA classification system, that categorize foods according to the extent and purpose of processing: unprocessed or minimally processed, processed culinary ingredients, processed food, and UPF. Keding et al. [11] interestingly emphasize the relevant role that food processing is playing in the food system sustainability, specifically regarding a sustainable diet due to the combination of low-cost ingredients at purchase and increased consumption worldwide. Regarding UPFs, they are formulations of ingredients, mostly of industrial use, made from substances extracted from food, with little or no whole food [12]. Most of them are high energy-dense products, rich in sugar, unhealthy fat and salt, and low in dietary fiber, protein, vitamins, and minerals. In addition, the industrial process often includes artificial additives in order to create durable, accessible, convenient, and attractive products. Some examples include soft drinks, processed meats, ice cream, snacks, sweets, instant soups, and fast foods [13].

There is increasing evidence that a high consumption of UPFs negatively affects nutritional dietary quality as is associated with an increase in free sugars, total fats, and saturated fats, as well as a decrease in nutrients such as fiber, protein, potassium, zinc, and magnesium, and vitamins A, C, D, E, B12, and niacin in adult population [14–16]. A recent systematic review showed that despite the limited literature on UPF consumption and health outcomes in the maternal-child population, the highest UPF consumption negatively impacted nutrition and disease development indicators in pregnant, lactating women and children [17]. The UPF are currently present in the dietary pattern of several high-income countries such as the United States, Canada, and the United Kingdom, and contribute on average greater than half of energy consumed [18]. The 2017–2018 Household Budget Survey showed that UPFs intake represents 19.7% of the daily caloric intake of Brazilians [19]. However, there is still limited data about Brazilian pregnant women's consumption of UPFs and its impact on nutritional dietary profile and quality of diet.

Considering the role of maternal diet on the health of the mother–child binomial, it is fundamental to understand the effect of UPF consumption during pregnancy on dietary nutrients intake. Therefore, this study aimed to investigate the association between UPF consumption, based on the NOVA food classification system, and dietary nutrients intake of women assisted by prenatal service in public Primary Health Care (PHC) in Federal District (DF), Brazil.

2. Materials and Methods

2.1. Study design and population

This study was approved by the Ethics Committee of the University of Brasilia (2.977.035) and of the Research Ethics Committee of the Federal District Health Department (3.489.243).

This analytical cross-sectional study is part of the project "Multicenter Study of Iodine Deficiency (EMDI-Brazil)", conducted with pregnant women assisted by prenatal service in PHC of the Unified Health System (SUS) in Federal District (DF), Brazil.

For this study, a simple random sample was calculated and performed using the StatCalc tool of the EpiInfo Software (Center for Disease Control and Prevention, USA), considering the average monthly prenatal care appointments at PHC in 2016 as a proxy for the number of pregnant women monitored by PHC in DF (n= 18,877 - data reported by the DF State Department of Health); and the prevalence of the indicator "consumption of ultra-processed foods the day before" among Brazilian pregnant women monitored by PHC (81.5%), in the same year, from the Food and Nutrition Surveillance System – SISVAN [20]. The acceptable error of 5.5% and the 95% confidence interval (95% CI) were considered. The minimum number of pregnant women to be included was defined as 190;

20% was added to the estimated number, anticipating possible losses. Thus, the sample was estimated at 228 pregnant women. Ten PHC units were selected based on the proximity to the central region and the highest monthly average prenatal care performed in 2016 (data reported by the State Department of Health of the DF).

Pregnant women from all gestational age (first, second and third trimesters) who attended the selected PHC units for prenatal follow-up consults were invited to participate before or after the appointment at the units. Participants with hypothyroidism or history of thyroid disease were not included due to possible interference with the primary outcomes investigated by the EMDI-Brazil.

2.2. Data collection and measures

Data collection was conducted from August 2019 to September 2021, through face-to-face interview. Exceptionally, during the period from November 2020 to April 2021, due to the COVID-19 pandemic restrictions, data collection was carried out via telephone and subsequent individual appointment was set for face-to-face application of the food consumption questionnaire.

A semi-structured questionnaire was applied by trained interviewers to obtain socioeconomic and demographic information related to the participant as follow: maternal age, self-reported skin color (white, brown, black, or Asian); maternal education (no education, elementary school, high school, or higher education); paid work in the previous month (yes or no); household income in the previous month (up to USD 94.00; between USD 94.00 and USD 188.00; between USD 188.00 and USD 566.00; above USD 566.00 or not informed); access to government social program (yes or no); cohabitation with a spouse or partner (yes or no) and self-recognition as head of the family (yes or no).

The questionnaire also comprised questions relating to pregnancy health and maternal lifestyle such as: gestational trimester (first, second or third); previous pregnancies (none, between 1 and 3, between 4 and 6 or more than 6); medical diagnosis of arterial hypertension before pregnancy (yes or no); current use of micronutrient supplement (yes or no); current use of cigarettes (yes or no); and current consumption of alcoholic beverages (yes or no).

For the current investigation, data regarding pre-gestational weight, last menstrual period data, current weight and height were collected from the medical records in pregnant women's prenatal card. If it was not recorded, self-reported data were collected. The pre-pregnancy BMI was calculated as weight in kilograms divided by height in meters squared and classified as recommended by the World Health Organization (WHO) [21].

Gestational Weight Gain (GWG) was calculated from the difference between the last measured gestational weight and the informed pre-gestational weight and classified as proposed by Kac et al. (2021) for Brazilian women from 10 weeks of gestation [22]. Pregnancy with less than 10 weeks were not considered in the GWG analysis (n=13). For this study, it was considered below the expected GWG < 25th percentile; according to the expected GWG between the 25th percentile and the 75th percentile; and above expected – or excessive – GWG > 75th percentile.

2.3. Dietary Assessment

To evaluate participants' food consumption, a 24-hour dietary recall was applied using the 5-step multiple-pass method developed by the United States Department of Agriculture [23]. The Photographic Manual of Food Portion Quantification [24] was used to improve dietary assessment. The manual includes photos of single foods and meals (e.g. mixed rice and beans, lasagna), as well as household measurements (e.g. cups, spoons) and portions of food. A second dietary recall was collected randomly by telephone in 20% of the sample on a nonconsecutive day to correct the within-person variability [25-28]. Food consumption data from 24h-hour dietary recall were analyzed for nutrients composition using the Globodiet software, developed by the GloboDiet Initiative, which

created and adapted a standardized and computerized method for data collection through of the 24-hour reminder [29].

The analysis of food consumption included the assessment of total energy intake, macronutrient, and micronutrient intake. The nutritional density of each micronutrient in the diet was expressed in mg or mcg per 1.000 kcal while macronutrients were expressed as the percentage of energy intake (%TEI). Food consumption was categorized according to the processing degree as defined by the NOVA classification: unprocessed or minimally processed, culinary ingredients, processed and ultra-processed [12]. The exposure variable of interest in this study was the UPF intake. The percentage of relative energy intake from UPFs were distributed into quintiles according to the contribution of ultra-processed foods to the total caloric value of the diet (% kcal). In order to calculate quintiles, participants were ranked according to their UPF energy intake from lowest to highest and then divided into five equal groups. The first quintile was classified as the lowest consumption percentage, and the fifth as the highest percentage of consumption. Micronutrient supplements were not considered in the dietary analysis.

2.4. Data analysis

The descriptive results were expressed as mean and standard deviation (SD) for continuous variable. To calculate the frequency related to categorical variables, the prevalence was estimated with their respective 95% CI.

The mean share of all NOVA food groups to the total daily energy intake was estimated. The participants were categorized into five strata in accordance with the quintiles of energy shares from UPF consumption. The association between the quintiles of energy from UPF and total energy and nutrients intake was assessed by the multivariate linear regression model. Quintile 1 was the reference category in all regression analyses. All analysis were adjusted for age, years of study, gestational trimester, social welfare program assistance and work status. The regression coefficients were presented with their respective confidence intervals (95%). A significance level of 0.05 was considered. The statistical analyses were carried out using Stata software (StataCorp. 2019. Stata Statistical Software: Release 16.1. College Station, TX, USA: StataCorp LLC).

3. Results

Data from 229 pregnant women enrolled in prenatal care in PHC were included. The participants' age ranged from 16 to 50 years old (mean age 28 ± 6.2 years). There is only one pregnant woman at the age of 50 in our sample. The majority of women self-reported brown skin color (60.6%) and 10-12 years of study (53.3%), and 44% of them lives with a monthly family income of US$188 to US$566. About 15% are assisted by government social welfare program, and 78% reported living with partner. Planned pregnancy were reported by 37% and 86% had at least one prenatal visit prior to 13 weeks of pregnancy. Regarding nutritional status, most of them (51.9%) entered pregnancy within normal BMI range, however, more than 50% presented inadequate GWG for gestational age (below or above the expected). Detailed subject characteristics are presented in Table 1.

Table 1. Characteristics of pregnant women assisted in Primary Health Care. Federal District, Brazil, 2019-2021.

Characteristics	*n*[a]	%	CI (95%)
Age (years)			
≤19	13	5.7	3.31; 9.55
20-34	179	78.2	72.31; 83.06
≥35	37	16.1	11.91; 21.53
Self-reported skin color			
White	45	20	15.18; 25.66
Black	36	15.9	11.69; 21.32

Yellow	8	3.5	1.77; 6.94
Brown	137	60.6	54.06; 66.81
Lives with partner			
Yes	177	78	72.08; 82.91
No	50	22	17.08; 27.91
Paid job over the past month			
Yes	122	53.7	47.19; 60.16
No	105	46.3	39.83; 52.80
Household income over the previous month (US$)			
Up to 94.00	13	5.8	3.35; 9.67
94.00 to 188.00	21	9.3	6.12; 13.85
188.00 to 566.00	100	44.2	37.87; 50.81
Over 566.00	59	26.1	20.76; 32.25
Not reported	33	14.6	10.55; 19.86
Family members			
< 4 members	181	81.5	75.84; 86.12
> 5 members	41	18.5	13.87; 24.15
Access to social welfare program			
Yes	34	15	10.93; 20.35
No	193	85	79.64; 89.06
Self-reported as head of household			
Yes	79	34.8	28.85; 41.26
No	148	65.2	58.73; 71.14
Education (completed years)			
Up to 9 years	38	16.7	12.40; 22.20
10 to 12 years	121	53.3	46.75; 59.73
Over 13 years	68	30.0	24.32; 36.26
Smoking habit			
Yes	9	4.0	2.06; 7.46
No	218	96.0	92.53; 97.93
Alcohol consumption			
yes	27	12.0	8.38; 17.03
No	197	88.0	82.96; 91.61
Parity			
Primiparous	83	36.6	30.52; 43.05
Multiparous	144	63.4	56.94; 69.47
Trimester of pregnancy			
1st trimester	35	15.3	11.16; 20.57
2nd trimester	91	39.7	33.57; 46.24
3rd trimester	103	45	38.62; 51.50
Pre-pregnancy BMI (kg/m²)			
Underweight	9	4.3	2.23; 8.05
Normal weight	109	51.9	45.11; 58.62
Overweight	59	28.1	22.40; 34.59
Obese	33	15.7	11.37; 21.31
Gestational Weight Gain[b]			
Below the expected (<p25)	62	29.7	26.83; 36.24
According to the expected (≥p25 e <p75)	99	47.4	40.64; 54.18
Above the expected (≥p75)	48	23.0	17.73; 29.19

[a]The total was lower for some variables due to missing information [b]Brazilian classification Chart (Kac et al., 2021)(KAC et al., 2021); BMI: Body Mass Index; CI: Confidence Interval.

The mean daily energy intake was 1741±646kcal. On average, pregnant women consumed 64.3±18.2% of total energy from unprocessed or minimally processed food, 4.5±4.3% from culinary ingredients, 8.6±9.9% from processed food and 22.6±17.2% from UPF.

The mean contribution of UPF to the total energy intake ranged from 2.7%, in the lowest quintile, to 49.9%, in the highest quintile. On adjusted multivariate linear regression, the highest quintile of energy contribution from UPF was associated with lower intake of calories from unprocessed and minimally processed food (β= -41.6; 95% CI: -46.70, -36.60) and from culinary ingredients (β= -2.41; 95% CI: -4.19, -0.63) compared to the first quintile. Table 2 presents mean percentage of energy intake from each food group during pregnancy according to quintiles of energy intake from UPF.

Table 2. Distribution (%) of total energy intake according to food groups by quintiles (Q1, Q2, Q3, Q4, Q5) of ultra-processed foods consumption for pregnant women assisted in Primary Health Care. Federal District, Brazil, 2019-2021 (n=227).

Food group	Mean energy intake by quintiles of UPF (% of total energy intake)					β (CI 95%)	*p*[a]
	Q1	Q2	Q3	Q4	Q5		
Unprocessed or minimally processed foods	82.58	71.73	66.67	59.25	40.79	-41.65 (-46.70, -36.60)	**0.000**
Culinary ingredients	5.97	5.29	4.40	3.69	3.31	-2.41 (-4.19, -0.63)	**0.008**
Processed foods	8.73	11.92	9.60	6.70	5.95	-3.23 (-7.41, 0.94)	0.128
Ultra-processed foods[b]	2.70	11.04	19.31	30.35	49.93	47.30 (45.08, 49.52)	**0.000**

β: linear regression coefficient; CI: Confidence Interval; UPF: ultra-processed food. [a] Multivariate linear regression adjusted for age, years of study, gestational trimester, social welfare program assistance and work status. [b] Mean and confidence interval (95%) of energy intake from UPF by quintiles: Q1 =50.9Kcal (34.0, 67.7); Q2= 185.9Kcal (168.7, 203.1); Q3= 340.9Kcal (305.8, 376.1); Q4= 508.1Kcal (454.1, 562.2); Q5= 1003.49Kcal (876.0, 1131).

Intake of macronutrients is expressed as a percentage of the total energy intake (TEI). Carbohydrates contributed 50% and protein 17% of TEI. Total fat contributed 33%, of which 11.2% was saturated, 10% monounsaturated, 8% polyunsaturated and 0.78% from trans fat. Fiber and micronutrients intake are described in Table 3.

Multivariate linear regression analyses (table 3) indicated that the highest quintile of UPF consumption was significantly and positively associated with an increase of 489 kcal in mean total energy intake (β= 489.0; 95% CI: 218.61, 759.48) and an increase of 0.5% in the contribution of trans-fat in TEI (β=0.5; 95%CI: 0.26, 0.73) comparing to the lowest reference quintile. In contrast, an inverse relationship was observed for protein intake, with a reduction of 5.97% in TEI (β= -5.97; 95%CI: -8.24, -3.70), and dietary fiber, with a reduction of 4.79g/1000kcal (β= -4.79; 95%CI: -6.65, -2.93) in the group with higher UPF consumption. No association was observed for carbohydrate and lipids intake.

Regarding micronutrients intake, the analysis showed significantly inverse association between the highest quintile of UPF consumption and intake of dietary iron, magnesium, potassium, copper, zinc, selenium, and folate. As compared with the first quintile of UPF consumption, pregnant women in the highest quintile consumed 30% more sodium, and approximately 36% less zinc, 67% less selenium, 19.5% less iron, and 28% less folate. No significant association was observed for calcium, iodine, vitamin D, A, C, E and B12 intake. Table 3 describes the analyses of the association between quintiles of UPF consumption and mean energy and dietary nutrient content.

Table 3. Mean energy and nutrient intake according to quintiles (Q1, Q2, Q3, Q4, Q5) of ultra-processed foods consumption of pregnant women assisted in Primary Health Care. Federal District, Brazil, 2019-2021 (n=227).

		Quintiles of UPF intake (% of total energy intake)					β (CI 95%) [a]	*p* [b]
	Total (SD)	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**		
Total Energy Intake (kcal/day)	1741 (646.45)	1537.71	1697.83	1792.18	1670.84	2009.48	489.0 (218.61; 759.48)	**0.000**
Distribution of total energy intake (%TEI)								
Carbohydrate	50 (10.5)	50.58	47.46	50.12	49.17	53.17	2.20 (-1.43; 7.25)	0.188
Protein	17 (5.8)	18.66	18.65	18.28	17.50	12.99	-5.97 (-8.24; -3.70)	**0.000**
Total fat	33 (7.4)	31.72	34.79	32.31	33.55	34.34	2.49 (-0.61; 5.60)	0.115
Saturated fat	11.2 (3.2)	10.64	12.11	10.65	10.91	11.48	0.72 (-0.58; 2.04)	0.275
Trans fat	0.78 (0.6)	0.55	0.8	0.77	0.81	1.00	0.5 (0.26; 0.73)	**0.000**
Monounsaturated fat	10 (2.96)	10.00	10.85	9.73	10.03	9.85	-0.21 (-1.45; 1.02)	0.735
Polyunsaturated fat	8 (3.10)	7.78	7.98	7.83	8.47	7.83	0.14 (-1.15; 1.43)	0.830
Nutrients density								
Fiber (g/1000kcal)	11.11 (4.8)	13.36	11.99	11.82	9.96	8.34	-4.79 (-6.65; -2.93)	**0.000**
Iron (mg/1000kcal)	5.27 (1.4)	5.48	5.93	5.13	5.35	4.46	-1.07 (-1.64; -0.50)	**0.000**
Calcium (mg/1000kcal)	329.08 (161.8)	314.45	343.55	338.69	333.48	315.36	-9.73 (-77.57; 58.10)	0.778
Magnesium (mg/1000kcal)	136.68 (37.5)	159.07	139.64	139.97	132.36	111.78	-47.83 (-62.44; -3.22)	**0.000**
Potassium (mg/1000kcal)	1273.63 (414.7)	1471.23	1334.02	1294.20	1210.61	1053.22	-424.79 (-590.46; -259.12)	**0.000**
Sodium (mg/1000kcal)	1283.65 (453.2)	1075.79	1263.31	1340.80	1329.03	1412.67	325.99 (139.64; 512.34)	**0.001**
Copper (mg/1000kcal)	0.83 (1.1)	0.98	1.04	0.88	0.76	0.49	-0.49 (-0.96; -0.02)	**0.040**
Iodine (mcg/1000kcal)	65.77 (31.2)	62.68	66.23	62.21	72.29	65.56	1.91 (-11.44; 15.27)	0.778
Zinc (mg/1000kcal)	6.02 (2.7)	6.23	7.42	6.22	6.15	4.07	-2.28 (-3.34; -1.23)	**0.000**
Selenium (mcg/1000kcal)	30.40 (69.7)	51.51	22.62	31.71	27.16	18.51	-34.36 (-61.62; -7.09)	**0.014**
Vitamin D (mcg/1000kcal)	1.96 (1.9)	2.04	2.17	1.89	2.29	1.41	-0.71 (-1.50; 0.07)	0.076
Vitamin A (mcg/1000kcal)	408.54 (1205)	409.63	662.96	379.13	384.96	206.67	-213.06 (-732.44; 306.31)	0.420
Vitamin C (mg/1000kcal)	82.53 (112)	85.3	89.04	111.97	79.01	46.63	-36.87 (-81.50; 7.74)	0.105
Vitamin E (mg/1000kcal)	4.13 (3.9)	4.45	5.52	3.88	3.57	3.24	-1.18 (-2.83; 0.47)	0.161
Vitamin B12 (mcg/1000kcal)	3.21 (5.37)	3.19	4.72	2.94	3.75	1.45	-1.90 (-4.17; 0.35)	0.098
Folate (mcg/1000kcal)	191.99 (82.3)	208.34	215.39	198.31	185.37	152.03	-58.27 (-91.79; -24.75)	**0.001**

β: linear regression coefficient; CI: Confidence Interval. TEI: Total Energy Intake; UPF: ultra-processed food. [a] Quintile 1 was the reference category; [b] Multivariate linear regression adjusted for age, years of study, gestational trimester, social welfare program assistance and work status.

4. Discussion

The present study analyzed the nutritional dietary profile, according to UPF consumption, of pregnant women assisted in prenatal public service PHC units. It is well-established that maternal diet quality and nutritional status during pregnancy directly impact maternal and child health [30–35]. In addition, there is growing evidence that UPF consumption is related to lower dietary quality in children and adults [14,36,37], and in pregnant women [38,39]. This is the first study to evaluate the impact of UPFs on the nutrient content of the diet consumed by pregnant women in the capital of Brazil.

In Brazil, the Household Budget Survey has shown that the contribution of UPFs to total energy intake increased from 14.3% in 2002–2003 to 19.7% in 2017–2018. Over the last two decades, the contribution of UPF to the total energy intake of the Brazilian population has continuously increased by replacing fresh foods and culinary preparations for ready-

to-eat and processed foods [19]. The results from our study showed that UPFs were considerably present in the diet of the evaluated pregnant women. It accounted for 22.6% of total energy intake in this sample, similar to the general Brazilian population [19]. Interestingly, a cross-sectional study conducted with Brazilian pregnant women from the Brazilian Northeast region observed similar UPF consumption (22.2%), and also showed an association with reduced consumption of rice, beans, meat, fruits, and vegetables [39]. Likewise, a cohort study of pregnant women from Sao Paulo showed that UPFs were responsible for 25.4% of daily calories [40]. A greater share of UPF in maternal diet is reported in other countries: among pregnant women in Spain, it accounted to 29.7% of daily calories [10]; in Canada, 47.7%; and in the USA, studies have shown that UPFs comprised over half of the energy intake during pregnancy [7,38].

According to Nilson et al. [41], approximately 57,000 premature deaths were estimated as attributable to the consumption of UPFs in Brazil in 2019, highlighting the impact of industrial food processing on preventable deaths. Thus, the high consumption of UPFs during pregnancy has important clinical significance given its negative impactive on maternal and neonatal health. Sartorelli et al. [42] showed that pregnant women with higher UPF intake had a three times higher chance of obesity when compared to women with lower intake of these foods. In another study, an increase in energy intake from UPFs was associated with an increase in gestational weight gain and neonatal adiposity [7]. A recent systematic review found that the consumption of UPF-rich diets during pregnancy was associated with higher risk of gestational diabetes mellitus and preeclampsia [6].

Consistent with previous research in general population samples, the results from our study demonstrated an inverse association of ultra-processed food intake with several indicators of overall diet quality. In addition to the high share of UPFs in the diet, this present study found that a greater intake of UPF consumption was associated with reduced intake of unprocessed or minimally processed foods. This group includes vegetables, fruits, beans, and meat, which provide critical nutrients for pregnancy such as protein, iron, folate, zinc, and vitamins [5]. The inadequate intake of key nutrients during pregnancy, as well as higher energy intake during fetal development, may modify fetal tissues reprogramming related to increased risk of the offspring to the development of future chronic disease [43].

Greater intake of UPFs was positively associated with higher energy, trans fat, and sodium intake in the pregnant women evaluated. In the same direction, a cohort study of pregnant women found consumption of sugar and sodium above the WHO upper limits in the higher UPF consumption group [40]. Typically, during manufacturing, UPFs undergo the addition of ingredients such as sugar, salt, and fats; hence, they tend to be energy dense and contribute to increased energy intake [13]. On this aspect, Hall et al. found an important association between higher intake of UPFs and higher energy intake in a randomized controlled trial with adults [44]. It is imperative to highlight that during pregnancy, adequate maternal energy intake is a critical point of care given that it is strongly associated with GWG and birth weight [45].

In addition, lower fiber and protein intake was observed in the highest quintile of UPF. Our results corroborate the fact that UPFs are energy-dense and high-fat foods, and low in protein and fiber [13]. The absence of an association between UPFs and saturated fat intake may be explained by the reformulation of processed food products by the food industry to avoid saturated fats in their composition [46].

Another interesting finding was an inverse association between greater UPF intake and nutrient intake such as iron, magnesium, potassium, copper, zinc, selenium, and folate. Our findings are corroborated by several previous studies who had demonstrated the association between UPF intake and lower dietary fiber, vitamins, and minerals daily consumption, showing that UPFs negatively impact the quality of the diet [38–40,47]. The negative impact of UPFs on nutrient content in pregnant women observed in this study is of critical concern as pregnancy is a period when nutritional requirements are markedly increased [3]. The literature has shown that even when a well-balanced diet is accessible,

micronutrient inadequacies during pregnancy are common, due to a global trend switch to low-quality diets, rich in UPFs, which has led to suboptimal intake especially of iron, iodine, folate, vitamin D, and vitamin B12 [31,48,49].

During pregnancy, environmental factors including nutrition have a significant impact on health in adult life [31]. In this phase, micronutrients play an important role in programming of postnatal pathophysiology, and inadequate perinatal nutrient status may adversely affect many developmental processes in the fetus with a negative impact on later life [50]. Key nutrients such as zinc, folate, and B vitamins are involved in one- carbon metabolism, which is necessary for cell proliferation, growth, and protein synthe- sis in the early stages of gestation. Inadequate intake of these nutrients may lead to several adverse outcomes including preeclampsia, preterm birth, gestational diabetes mellitus, intrauterine growth restriction, adverse birth weight, and stillbirth, as well as perinatal, neonatal and maternal mortality [5].

The lower intake of vegetables, fruits, and whole foods suggests that UPFs may be perceived as more palatable or convenient foods. A recent study demonstrated that UPFs were found to be low-cost and nutrient-poor as compared to unprocessed foods [51]. While food prices are a complex concept, the cost of food is an important determinant, especially in lower and middle-incomes countries. In Brazil, UPFs were the most expensive food group in 1995; however, the price of UPFs underwent successive reductions since the year 2000, and it is estimated that in the year 2026, they will be cheaper than unprocessed food [52]. Some studies already presented that higher UPF consumption may threaten all food system dimensions sustainability due to the combination of low-cost ingredients at purchase and increased consumption worldwide, when compared to raw foods [53–55].

The findings of this study reveal that although pregnancy is an important period when nutrition plays a fundamental role in maternal and fetal health, it is noted that the dietary pattern of pregnant women evaluated in this study still does not fully meet the dietary recommendations available. The Dietary Guidelines for the Brazilian Population emphasizes the consumption of a diet based on natural or minimally processed food, rich in plant-based foods, and recommends avoiding UPFs [56]. A study conducted by Gomes et al. (2019) showed the reduction of UPF intake in Brazilian pregnant women in the first and second trimester of pregnancy by 4.6 points in the healthy eating and physical activity interventions group by health professionals in the PHC [57]. These findings may help to target specific populational groups for guidance to reduce the UPF consumption and evidence the importance to better understand the influence of ultra-processed food consumption during pregnancy. Educational interventions discouraging the consumption of UPFs rich diets and encouraging a minimally processed diet rich in fruits and vegetables might be an effective way to reduce the share of UPFs in pregnant diets and to increase micronutrients intake. Further studies approaching nutritional interventions targeting the reduction of UPF in perinatal period are needed to clarify its impact on maternal diet quality.

Since the pregnancy period is considered a window of opportunity to improve maternal–child health [58], eating pattern during pregnancy is a critical point that should be addressed during prenatal care. While the results may support nutritional recommendations for this population it has some limitations. First, the cross-sectional design, which prevents causality evaluation. In addition, the self-reported 24-h dietary assessment depends on participant memory, cooperation, and communication abilities, and might contain some errors due to memory biases and over/underreporting, with the added disadvantage that it cannot describe a typical diet. Also, the estimation of the usual intake was not conducted, then it was not possible to estimate intraindividual variance and nutrient intake adequacy. Furthermore, it is limited to generalizing the results, taking into account the heterogeneity of physiological, and emotional status that may have specific dietary influences across the gestational trimesters. Regarding the sample, the study included

only low-risk obstetric population in a prenatal public service. However, in Federal District, public Primary Health Care covers 58.72% of the local population [59].

Despite these limitations, it is important to highlight the study strengths. To date, this is the first study on this topic with data from Brazilian pregnant women from the Federal District region; the dietary assessment was applied by well-trained nutrition professionals using the 5-steps multiple pass methodology, in addition to the use of the photographic manual of food portions, to enhance accuracy of dietary recall and to reduce bias in portion quantification; and data analysis was conducted with robust methods. The results of the present study indicate important public health implications, given that higher UPF consumption may worsen the nutritional quality of the diet.

5. Conclusions

The results of this present study indicate that greater UPF intake negatively impacts the nutritional quality and nutrient intake of pregnant women. It suggests that nutritional recommendations for this population should focus not only on nutrient amounts but also on the degree of food processing. The consumption of a diet rich in whole foods, protein sources, fruits, and vegetables should be reinforced during prenatal care as a strategy to improve short and long-term maternal and neonatal health.

Author Contributions: Conceptualization, W.O.P; V.S.S.G; N.P. and S.C.C.F.; methodology, W.O.P; V.S.S.G; N.P. and S.C.C.F.; formal analysis, W.O.P.; E.S.O.P; investigation, W.O.P; E.S.O.P.; N.P.; data curation, W.O.P.; E.S.O.P; V.S.S.G; writing—original draft preparation, W.O.P.; writing—review and editing, W.O.P.; N.P.; supervision, N.P.; All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by DGP / University of Brasilia and PPGNH / UnB (011/2022).

Institutional Review Board Statement: The study was submitted and approved by the Research Ethics Committee of the Faculty of Health Sciences of the University of Brasília (CAAE: 80172617.0.2008.0030 and number: 2,977,035) and by the Research Ethics Committee of the Federal District Health Department (CAAE: 09940819.2.3001.5553 and number: 3,489,243). All steps were carried out following Resolution Nº. 466 of December 12, 2012, of the National Health Council.

Informed Consent Statement: Data collection from pregnant women was conducted after reading, understanding, and signed authorization by them of the Free and Informed Consent Term.

Data Availability Statement: Data are available on reasonable request. The dataset used to conduct the analyses is available from the corresponding author on reasonable request.

Acknowledgments: The authors thank the managers of the Basic Health Units of the Federal District for their support in carrying out data collection; and thank to the Multicenter Study of Iodine Deficiency in the Maternal and Infant Population (EMDI-Brazil), of which this study is a part, for logistical and organizational support during the planning and execution phases.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Soma-Pillay, P.; Nelson-Piercy, C.; Tolppanen, H.; Mebazaa, A. Physiological Changes in Pregnancy. Cardiovasc. J. Afr. 2016, 27, 89–94. https://doi.org/10.5830/CVJA-2016-021.
2. Kominiarek, M.A.; Rajan, P. Nutrition Recommendations in Pregnancy and Lactation. Med. Clin. N. Am. 2016, 100, 1199–1215. https://doi.org/10.1016/j.mcna.2016.06.004.
3. WHO. Good Maternal Nutrition: The Best Start in Life; WHO Regional Office for Europe: Copenhagen, Denmark, 2016; ISBN 9789289051545.
4. Ramakrishnan, U.; Grant, F.; Goldenberg, T.; Zongrone, A.; Martorell, R. Effect of Women's Nutrition before and during Early Pregnancy on Maternal and Infant Outcomes: A Systematic Review. Paediatr. Perinat. Epidemiol. 2012, 26, 285–301. https://doi.org/10.1111/j.1365-3016.2012.01281.x.
5. Birhanie, M.W.; Adekunle, A.O.; Arowojolu, A.O.; Dugul, T.T.; Mebiratie, A.L. Micronutrients Deficiency and Their Associations with Pregnancy Outcomes: A Review. Nutr. Diet. Suppl. 2020, 12, 237–254. https://doi.org/10.2147/nds.s274646.
6. Paula, W.O.; Patriota, E.S.O.; Gonçalves, V.S.S.; Pizato, N. Maternal Consumption of Ultra-Processed Foods-Rich Diet and

Perinatal Outcomes: A Systematic Review and Meta-Analysis. Nutrients 2022, 14, 3242. https://doi.org/10.3390/nu14153242.

7. Rohatgi, K.W.; Tinius, R.A.; Cade, W.T.; Steele, E.M.; Cahill, A.G.; Parra, D.C. Relationships between Consumption of Ultra-Processed Foods, Gestational Weight Gain and Neonatal Outcomes in a Sample of US Pregnant Women. PeerJ 2017, 2017, e4091. https://doi.org/10.7717/peerj.4091.
8. Deierlein, A.L.; Ghassabian, A.; Kahn, L.G.; Afanasyeva, Y.; Mehta-Lee, S.S.; Brubaker, S.G.; Trasande, L. Dietary Quality and Sociodemographic and Health Behavior Characteristics Among Pregnant Women Participating in the New York University Children's Health and Environment Study. Front. Nutr. 2021, 8, 639425. https://doi.org/10.3389/fnut.2021.639425.
9. Rojhani, A.; Ouyang, P.; Gullon-Rivera, A.; Dale, T.M. Dietary Quality of Pregnant Women Participating in the Special Supplemental Nutrition Program for Women, Infants, and Children. Int. J. Environ. Res. Public Health 2021, 18, 8370. https://doi.org/10.3390/ijerph18168370.
10. Leone, A.; Martínez-González, M.Á.; Craig, W.; Fresán, U.; Gómez-Donoso, C.; Bes-Rastrollo, M. Pre-Gestational Consumption of Ultra-Processed Foods and Risk of Gestational Diabetes in a Mediterranean Cohort. The SUN Project. Nutrients 2021, 13, 2202. https://doi.org/10.3390/nu13072202.
11. Keding, G.B.; Schneider, K.; Jordan, I. Production and Processing of Foods as Core Aspects of Nutrition-Sensitive Agriculture and Sustainable Diets. Food Secur. 2013, 5, 825–846. https://doi.org/10.1007/s12571-013-0312-6.
12. Monteiro, C.A.; Levy, R.B.; Claro, R.M.; de Castro, I.R.R.; Cannon, G. A New Classification of Foods Based on the Extent and Purpose of Their Processing. Cad. Saude Publica 2010, 26, 2039–2049. https://doi.org/10.1590/s0102-311x2010001100005.
13. Monteiro, C.A.; Cannon, G.; Levy, R.B.; Moubarac, J.C.; Louzada, M.L.C.; Rauber, F.; Khandpur, N.; Cediel, G.; Neri, D.; Martinez-Steele, E.; et al. Ultra-Processed Foods: What They Are and How to Identify Them. Public Health Nutr. 2019, 22, 936– 941.
14. Louzada, M.L.d.C.; Martins, A.P.B.; Canella, D.S.; Baraldi, L.G.; Levy, R.B.; Claro, R.M.; Moubarac, J.C.; Cannon, G.; Monteiro, C.A. Impact of Ultra-Processed Foods on Micronutrient Content in the Brazilian Diet. Rev. Saude Publica 2015, 49, 1–8. https://doi.org/10.1590/S0034-8910.2015049006211.
15. Martini, D.; Godos, J.; Bonaccio, M.; Vitaglione, P.; Grosso, G. Ultra-Processed Foods and Nutritional Dietary Profile: A Meta-Analysis of Nationally Representative Samples. Nutrients 2021, 13, 3390. https://doi.org/10.3390/nu13103390.
16. Martínez Steele, E.; Popkin, B.M.; Swinburn, B.; Monteiro, C.A. The Share of Ultra-Processed Foods and the Overall Nutritional Quality of Diets in the US: Evidence from a Nationally Representative Cross-Sectional Study. Popul. Health Metr. 2017, 15, 6. https://doi.org/10.1186/s12963-017-0119-3.
17. de Oliveira, P.; de Sousa, J.; Assunção, D. Impacts of Consumption of Ultra-Processed Foods on the Maternal-Child Health: A Systematic Review. Front. Nutr. 2022, 9, 821657. https://doi.org/10.3389/fnut.2022.821657.
18. Baker, P.; Machado, P.; Santos, T.; Sievert, K.; Backholer, K.; Hadjikakou, M.; Russell, C.; Huse, O.; Bell, C.; Scrinis, G.; et al. Ultra-processed Foods and the Nutrition Transition: Global, Regional and National Trends, Food Systems Transformations and Political Economy Drivers. Obes. Rev. 2020, 21, e13126. https://doi.org/10.1111/obr.13126.
19. IBGE. Pesquisa de Orçamentos Familiares 2017–2018: Análise Do Consumo Alimentar Pessoal No Brasil; Instituto Brasileiro de Geografia e Estatística—IBGE, Ed.; IBGE: Rio de Janeiro, Brazil, 2020; ISBN 978-85-240-4505-9.
20. Ministry of Health of Brazil. Food and Nutrition Surveillance System—SISVAN. Public Access Reports. Report on Food Consumption of Individuals Monitored by Period, Stage of the Life Cycle and Index; Ministry of Health: Brasilia, Brazil, 2016.
21. WHO. Obesity : Preventing and Managing the Global Epidemic: Report of a WHO Consultation; WHO: Geneva, Switzerland, 2000.
22. Kac, G.; Carilho, T.R.B.; Rasmussen, K.M.; Reichenheim, M.E.; Farias, D.R.; Hutcheon, J.A. Gestational Weight Gain Charts: Results from the Brazilian Maternal and Child Nutrition Consortium. Am. J. Clin. Nutr. 2021, 113, 1351–1360. https://doi.org/10.1093/ajcn/nqaa402.
23. Conway, J.M.; Ingwersen, L.A.; Vinyard, B.T.; Moshfegh, A.J. Effectiveness of the US Department of Agriculture 5-Step Multiple-Pass Method in Assessing Food Intake in Obese and Nonobese Women. Am. J. Clin. Nutr. 2003, 77, 1171–1178. https://doi.org/10.1093/ajcn/77.5.1171.
24. Crispim, S.P. Manual Fotográfico de Quantificação Alimentar, 1st ed.; Universidade Federal do Paraná: Curitiba, Brazil, 2017; ISBN 978-85-68566-08-4.
25. Verly-Jr, E.; Castro, M.A.; Fisberg, R.M.; Marchioni, D.M.L. Precision of Usual Food Intake Estimates According to the Percentage of Individuals with a Second Dietary Measurement. J. Acad. Nutr. Diet. 2012, 112, 1015–1020. https://doi.org/10.1016/j.jand.2012.03.028.
26. Tooze, J.A.; Midthune, D.; Dodd, K.W.; Freedman, L.S.; Krebs-Smith, S.M.; Subar, A.F.; Guenther, P.M.; Carroll, R.J.; Kipnis, V. A New Statistical Method for Estimating the Usual Intake of Episodically Consumed Foods with Application to Their Distribution. J. Am. Diet. Assoc. 2006, 106, 1575–1587. https://doi.org/10.1016/j.jada.2006.07.003.
27. Dodd, K.W.; Guenther, P.M.; Freedman, L.S.; Subar, A.F.; Kipnis, V.; Midthune, D.; Tooze, J.A.; Krebs-Smith, S.M. Statistical

Methods for Estimating Usual Intake of Nutrients and Foods: A Review of the Theory. J. Am. Diet. Assoc. 2006, 106, 1640–1650. https://doi.org/10.1016/j.jada.2006.07.011.

28. Freedman, L.S.; Guenther, P.M.; Dodd, K.W.; Krebs-Smith, S.M.; Midthune, D. The Population Distribution of Ratios of Usual Intakes of Dietary Components That Are Consumed Every Day Can Be Estimated from Repeated 24-Hour Recalls. J. Nutr. 2010, 140, 111–116. https://doi.org/10.3945/jn.109.110254.
29. Bel-Serrat, S.; Knaze, V.; Nicolas, G.; Marchioni, D.M.; Steluti, J.; Mendes, A.; Crispim, S.P.; Fisberg, R.M.; Pereira, R.A.; Araujo, M.C.; et al. Adapting the Standardised Computer- and Interview-Based 24 h Dietary Recall Method (GloboDiet) for Dietary Monitoring in Latin America. Public Health Nutr. 2017, 20, 2847–2858. https://doi.org/10.1017/S1368980017001872.
30. Yu, Y.; Hardy, I.; Sun, W.; Dean, F.; Zhou, Y.; Feng, C.; Ouyang, F.; Marc, I.; Fraser, W.; Dubois, L. Association between Diet Quality during Preconception or Pregnancy and Adverse Perinatal Outcomes: A Systematic Review and Meta-Analysis. Authorea 2021. https://doi.org/10.22541/au.163251147.74307797/v1
31. Cetin, I.; Bühling, K.; Demir, C.; Kortam, A.; Prescott, S.L.; Yamashiro, Y.; Yarmolinskaya, M.; Koletzko, B. Impact of Micronutrient Status during Pregnancy on Early Nutrition Programming. Ann. Nutr. Metab. 2019, 74, 269–278. https://doi.org/10.1159/000499698.
32. Abdollahi, S.; Soltani, S.; De Souza, R.J.; Forbes, S.C.; Toupchian, O.; Salehi-Abargouei, A. Associations between Maternal Dietary Patterns and Perinatal Outcomes: A Systematic Review and Meta-Analysis of Cohort Studies. Adv. Nutr. 2021, 12, 1332– 1352. https://doi.org/10.1093/advances/nmaa156.
33. Borge, T.C.; Aase, H.; Brantsæter, A.L.; Biele, G. The Importance of Maternal Diet Quality during Pregnancy on Cognitive and Behavioural Outcomes in Children: A Systematic Review and Meta-Analysis. BMJ Open 2017, 7, e016777. https://doi.org/10.1136/bmjopen-2017-016777.
34. Schoenaker, D.A.J.M.; Mishra, G.D.; Callaway, L.K.; Soedamah-Muthu, S.S. The Role of Energy, Nutrients, Foods, and Dietary Patterns in the Development of Gestational Diabetes Mellitus: A Systematic Review of Observational Studies. Diabetes Care 2016, 39, 16–23. https://doi.org/10.2337/dc15-0540.
35. Chen, L.W.; Aris, I.M.; Bernard, J.Y.; Tint, M.T.; Chia, A.; Colega, M.; Gluckman, P.D.; Shek, L.P.C.; Saw, S.M.; Chong, Y.S.; et al. Associations of Maternal Dietary Patterns during Pregnancy with Offspring Adiposity from Birth until 54 Months of Age. Nutrients 2017, 9, 2. https://doi.org/10.3390/nu9010002.
36. Liu, J.; Steele, E.M.; Li, Y.; Karageorgou, D.; Micha, R.; Monteiro, C.A.; Mozaffarian, D. Consumption of Ultraprocessed Foods and Diet Quality Among U.S. Children and Adults. Am. J. Prev. Med. 2022, 62, 252–264. https://doi.org/10.1016/j.amepre.2021.08.014.
37. Lauria, F.; Dello Russo, M.; Formisano, A.; De Henauw, S.; Hebestreit, A.; Hunsberger, M.; Krogh, V.; Intemann, T.; Lissner, L.; Molnar, D.; et al. Ultra-Processed Foods Consumption and Diet Quality of European Children, Adolescents and Adults: Results from the I.Family Study. Nutr. Metab. Cardiovasc. Dis. 2021, 31, 3031–3043. https://doi.org/10.1016/j.numecd.2021.07.019.
38. Nansel, T.R.; Cummings, J.R.; Burger, K.; Siega-Riz, A.M.; Lipsky, L.M. Greater Ultra-Processed Food Intake during Pregnancy and Postpartum Is Associated with Multiple Aspects of Lower Diet Quality. Nutrients 2022, 14, 3933. https://doi.org/10.3390/nu14193933.
39. Graciliano, N.G.; da Silveira, J.A.C.; Oliveira, A.C.M. de The Consumption of Ultra-Processed Foods Reduces Overall Quality of Diet in Pregnant Women. Cad. Saude Publica 2021, 37, e00030120. https://doi.org/10.1590/0102-311x00030120.
40. Paulino, D.S.M.; Pinho-Pompeu, M.; Assumpção, D.; Kasawara, K.T.; Surita, F.G. Dietary Intake Profile in High-Risk Pregnant Women According to the Degree of Food Processing. J. Matern. Neonatal Med. 2020, 35, 3330–3336. https://doi.org/10.1080/14767058.2020.1818213.
41. Nilson, E.A.F.; Ferrari, G.; Louzada, M.L.C.; Levy, R.B.; Monteiro, C.A.; Rezende, L.F.M. Premature Deaths Attributable to the Consumption of Ultraprocessed Foods in Brazil. Am. J. Prev. Med. 2022, 64, 129–136. https://doi.org/10.1016/j.amepre.2022.08.013.
42. Sartorelli, D.S.; Crivellenti, L.C.; Zuccolotto, D.C.C.; Franco, L.J. Relationship between Minimally and Ultra-Processed Food Intake during Pregnancy with Obesity and Gestational Diabetes Mellitus. Cad. Saude Publica 2019, 35, e00049318. https://doi.org/10.1590/0102-311X00049318.
43. Barker, D.J.P. Developmental Origins of Chronic Disease. Public Health 2012, 126, 185–189. https://doi.org/10.1016/j.puhe.2011.11.014.
44. Hall, K.D.; Ayuketah, A.; Brychta, R.; Cai, H.; Cassimatis, T.; Chen, K.Y.; Chung, S.T.; Costa, E.; Courville, A.; Darcey, V.; et al. Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. Cell Metab. 2019, 30, 67–77.e3. https://doi.org/10.1016/j.cmet.2019.05.008.
45. Minami, M.; J-P, N.A.; Noguchi, S.; Eitoku, M.; Muchanga, S.M.J.; Mitsuda, N.; Komori, K.; Yasumitsu-Lovell, K.; Maeda, N.; Fujieda, M.; et al. Gestational Weight Gain Mediates the Effects of Energy Intake on Birth Weight among Singleton Pregnancies in the Japan Environment and Children's Study. BMC Pregnancy Childbirth 2022, 22, 568, doi:10.1186/s12884-022-04898-3.

46. WHO. Department of Nutrition and Food Safety. Reformulation of Food and Beverage Products for Healthier Diets: Policy Brief. Geneva, Switzerland, 2022. (Electronic Version). 2022. Available online: https://www.who.int/publications/i/item/9789240039919Silva (accessed on 27 November 2022).
47. A.C.; Corrêa, M.J.G.; de Sousa, T.M.; Santos, L.C. dos Association between Ultra-Processed Food Consumption and Nutrient Intake among Low-Risk Pregnant Women. Rev. Bras. Saúde Matern. Infant. 2022, 22, 481–487. https://doi.org/10.1590/1806-9304202200030003.
48. Blumfield, M.L.; Hure, A.J.; Macdonald-Wicks, L.; Smith, R.; Collins, C.E. A Systematic Review and Meta-Analysis of Micronutrient Intakes during Pregnancy in Developed Countries. Nutr. Rev. 2013, 71, 118–132. https://doi.org/10.1111/nure.12003.
49. Parisi, F.; Laoreti, A.; Cetin, I. Multiple Micronutrient Needs in Pregnancy in Industrialized Countries. Ann. Nutr. Metab. 2014, 65, 13–21. https://doi.org/10.1159/000365794.
50. Fall, C.H.D.; Kumaran, K. Metabolic Programming in Early Life in Humans. Philos. Trans. R. Soc. B Biol. Sci. 2019, 374, 20180123. https://doi.org/10.1098/rstb.2018.0123.
51. Gupta, S.; Hawk, T.; Aggarwal, A.; Drewnowski, A. Characterizing Ultra-Processed Foods by Energy Density, Nutrient Density, and Cost. Front. Nutr. 2019, 6, 70. https://doi.org/10.3389/fnut.2019.00070.
52. Maia, E.G.; dos Passos, C.M.; Levy, R.B.; Bortoletto Martins, A.P.; Mais, L.A.; Claro, R.M. What to Expect from the Price of Healthy and Unhealthy Foods over Time? The Case from Brazil. Public Health Nutr. 2020, 23, 579–588. https://doi.org/10.1017/S1368980019003586.
53. Fardet, A.; Rock, E. Ultra-Processed Foods and Food System Sustainability: What Are the Links? Sustainability 2020, 12, 6280. https://doi.org/10.3390/su12156280.
54. Johnston, J.L.; Fanzo, J.C.; Cogill, B. Understanding Sustainable Diets: A Descriptive Analysis of the Determinants and Processes That Influence Diets and Their Impact on Health, Food Security, and Environmental Sustainability. Adv. Nutr. 2014, 5, 418–429. https://doi.org/10.3945/an.113.005553.
55. FAO. Strengthening Sector Policies for Better Food Security and Nutrition Results: Food Systems for Healthy Diets; Food and Agriculture Organization of the United Nations (FAO): Rome, Italy, 2019.
56. BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Guia Alimentar Para a População Brasileira, 2nd ed.; da Saúde, M., Ed.; Ministério da Saúde: Brasília, Brazil, 2014; 156p. ISBN 978-85-334-2176-9.
57. Gomes, C.d.B.; Malta, M.B.; Louzada, M.L. da C.; Benício, M.H.D.; Barros, A.J.D.; Carvalhaes, M.A. de B.L. Ultra-Processed Food Consumption by Pregnant Women: The Effect of an Educational Intervention with Health Professionals. Matern. Child Health J. 2019, 23, 692–703. https://doi.org/10.1007/s10995-018-2690-z.
58. Arabin, B.; Baschat, A.A. Pregnancy: An Underutilized Window of Opportunity to Improve Long-Term Maternal and Infant Health—An Appeal for Continuous Family Care and Interdisciplinary Communication. Front. Pediatr. 2017, 5, 69. https://doi.org/10.3389/fped.2017.00069.
59. Ministry of Health of Brazil Primary Health Care Coverage Public Reports. Available online: https://egestorab.saude.gov.br/paginas/acessoPublico/relatorios/ relHistoricoCoberturaAB.xhtml (accessed on 16 November 2022).

6. Conclusão

Os resultados dos estudos mostraram que o consumo de dietas ricas em alimentos UTPs durante a gestação foi associado a maior risco de diabetes mellitus gestacional e pré-eclâmpsia. Adicionalmente, foi observada associação significativa entre o maior percentual de contribuição energética a partir de UTP na dieta e o menor consumo de alimentos in natura e ingredientes culinários, além da associação positiva com maior consumo de energia total, gordura trans e sódio; e inversamente associado com o conteúdo da dieta de proteína, fibra, ferro, magnésio, potássio, cobre, zinco, selênio e folato, impactando negativamente na qualidade nutricional e na ingestão de nutrientes pelas gestantes acompanhadas na atenção primária à saúde.

A assistência pré-natal deve ser vista como uma janela de oportunidade para prevenção de desfechos adversos em saúde a curto e longo prazo. Intervenções focadas na redução do consumo de alimentos não saudáveis como os UTP na dieta materna devem ser reforçadas, ao passo que o maior consumo de frutas, hortaliças e boas fontes proteicas deve ser incentivado atendendo ao Guia Alimentar para a População Brasileira. Os resultados deste estudo podem subsidiar o planejamento de ações de atenção à saúde e de recomendações nutricionais para gestantes nos serviços de atenção básica.

7. Referências Bibliográficas

ABBASI, R.; BAKHSHIMOGHADDAM, F.; ALIZADEH, M. Major dietary patterns in relation to preeclampsia among Iranian pregnant women: a case–control study. **The Journal of Maternal-Fetal & Neonatal Medicine**, v. 34, n. 21, p. 3529–3536, 2 nov. 2019.

ACOG. Gestational Hypertension and Preeclampsia. **Obstetrics & Gynecology**, v. 135, n. 6, p. e237–e260, jun. 2020.

ALVES-SANTOS, N. H. et al. Prepregnancy Dietary Patterns and Their Association with Perinatal Outcomes: A Prospective Cohort Study. **Journal of the Academy of Nutrition and Dietetics**, v. 119, n. 9, p. 1439–1451, 2019.

AMERICAN DIABETES ASSOCIATION. Management of diabetes in pregnancy: Standards of medical care in diabetes-2021. **Diabetes Care**, v. 44, p. S200–S210, 1 jan. 2021.

AMEZCUA-PRIETO, C. et al. Types of carbohydrates intake during pregnancy and frequency of a small for gestational age newborn: A case-control study. **Nutrients**, v. 11, n. 3, p. 1–10, 2019.

ASADI, M. et al. The relationship between pre-pregnancy dietary patterns adherence and risk of gestational diabetes mellitus in Iran: A case–control study. **Nutrition and Dietetics**, v. 76, n. 5, p. 597–603, 2019.

ASHLEY-MARTIN, J.; WOOLCOTT, C. Gestational Weight Gain and Postpartum Weight Retention in a Cohort of Nova Scotian Women. **Maternal and Child Health Journal**, v. 18, n. 8, p. 1927–1935, 2014.

BAUGH, N. et al. The Impact of Maternal Obesity and Excessive Gestational Weight Gain on Maternal and Infant Outcomes in Maine: Analysis of Pregnancy Risk Assessment Monitoring System Results from 2000 to 2010. **Journal of Pregnancy**, v. 2016, p. 1–10, 2016.

BAYE MULU, G. et al. Determinants of Low Birth Weight Among Newborns Delivered in Public Hospitals in Addis Ababa, Ethiopia: Case-Control Study . **Pediatric Health, Medicine and Therapeutics**, v. Volume 11, p. 119–126, mar. 2020.

BEL-SERRAT, S. et al. Adapting the standardised computer- and interview-based 24 h dietary recall method (GloboDiet) for dietary monitoring in Latin America. **Public Health Nutrition**, v. 20, n. 16, p. 2847–2858, 14 nov. 2017.

BELLAMY, L. et al. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. **The Lancet**, v. 373, n. 9677, p. 1773–1779, 2009.

BENHAM, J. L. et al. Prevalence of and risk factors for excess weight gain in pregnancy: a cross-sectional study using survey data. **CMAJ open**, v. 9, n. 4, p. E1168–E1174, 1 out. 2021.

BIRATU, A. K.; WAKGARI, N.; JIKAMO, B. Magnitude of fetal macrosomia and its associated factors at public health institutions of Hawassa city, southern Ethiopia. **BMC Research Notes**, v. 11, n. 1, 13 dez. 2018.

BIRHANIE, M. W. et al. Micronutrients Deficiency and Their Associations with Pregnancy Outcomes: A Review . **Nutrition and Dietary Supplements**, v. Volume 12, p. 237–254, 2020.

BLENCOWE, H. et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. **Lancet (London, England)**, v. 379, n. 9832, p. 2162–2172, jun. 2012.

BONACCIO, M. et al. Joint association of food nutritional profile by Nutri-Score front-of-pack label and ultra-processed food intake with mortality: Moli-sani prospective cohort study. **BMJ**, p. e070688, 31 ago. 2022.

BORGEN, I. et al. Maternal sugar consumption and risk of preeclampsia in nulliparous Norwegian women. **European Journal of Clinical Nutrition**, v. 66, n. 8, p. 920–925, 2012.

BRASIL. **Guia Alimentar para a População Brasileira**. 2. ed. Brasília: Ministério da Saúde, 2014.

BRASIL. **Public Access Reports. Report on Food Consumption of individuals monitored by period, stage of the life cycle and indexMinistry of Health of Brazil; Food and Nutrition Surveillance System - SISVAN**. Brasília: [s.n.].

CASAGRANDE, S. S.; LINDER, B.; COWIE, C. C. Prevalence of gestational diabetes and subsequent Type 2 diabetes among U.S. women. **Diabetes Research and Clinical Practice**, v. 141, p. 200–208, 1 jul. 2018.

CHEN, X. et al. Consumption of ultra-processed foods and health outcomes: A systematic review of epidemiological studies. **Nutrition Journal**, v. 19, n. 1, p. 1–10, 2020.

CHIA, A. R. et al. Maternal Dietary Patterns and Birth Outcomes: A Systematic Review and Meta-Analysis. **Advances in Nutrition**, v. 10, n. 4, p. 685–695, 2019.

CONWAY, J. M. et al. Effectiveness of the US Department of Agriculture 5-step multiple-pass method in assessing food intake in obese and nonobese women. **The American Journal of Clinical Nutrition**, v. 77, n. 5, p. 1171–1178, 1 maio 2003.

COSTA, C. DOS S. et al. Consumo de alimentos ultraprocessados e associação com fatores sociodemográficos na população adulta das 27 capitais brasileiras (2019). **Revista de Saúde Pública**, v. 55, p. 47, 27 jul. 2021.

CRISPIM, S. P. **Manual fotográfico de quantificação alimentar**. 1st. ed. Curitiba: Universidade Federal do Paraná., 2017.

CZARNOBAY, S. A. et al. **Predictors of excess birth weight in Brazil: a systematic reviewJornal de Pediatria**Elsevier Editora Ltda, , 1 mar. 2019.

DE ARAÚJO, B. F. et al. Analysis of neonatal morbidity and mortality in late-preterm newborn infants. **Jornal de Pediatria**, v. 88, n. 3, p. 259–266, maio 2012.

DE BOO, H. A.; HARDING, J. E. The developmental origins of adult disease (Barker) hypothesis. **The Australian and New Zealand Journal of Obstetrics and Gynaecology**, v. 46, n. 1, p. 4–14, fev. 2006.

DEEKS, J. J.; HIGGINS, J. P. T.; ALTMAN, D. G. (EDITORS). Analysing data and undertaking meta-analyses. In: HIGGINS, J. P. T. et al. (Eds.). . **Cochrane Handbook for Systematic Reviews of Interventions**. version 6. ed. [s.l.] Cochrane, 2022.

DEIERLEIN, A. L. et al. Dietary Quality and Sociodemographic and Health Behavior Characteristics Among Pregnant Women Participating in the New York University Children's Health and Environment Study. **Frontiers in Nutrition**, v. 8, 9 abr. 2021.

DEVLIN, M. J.; BOUXSEIN, M. L. Influence of pre- and peri-natal nutrition on skeletal acquisition and maintenance. **Bone**, v. 50, n. 2, p. 444–451, fev. 2012.

DICKEN, S. J.; BATTERHAM, R. L. The Role of Diet Quality in Mediating the Association between Ultra-Processed Food Intake, Obesity and Health-Related Outcomes: A Review of Prospective Cohort Studies. **Nutrients**, v. 14, n. 1, p. 23, 22 dez. 2021.

DOMINGUEZ, L. J. et al. Fast food consumption and gestational diabetes incidence in the SUN project. **PLoS ONE**, v. 9, n. 9, p. 1–7, 2014.

DUDE, A. M. et al. Gestational Weight Gain and Pregnancy Outcomes among Nulliparous Women. **American Journal of Perinatology**, v. 38, n. 2, p. 182–190, 1 jan. 2021.

DUQUE-GUIMARÃES, D. E.; OZANNE, S. E. **Nutritional programming of insulin resistance: Causes and consequencesTrends in Endocrinology and Metabolism**, out. 2013.

EADES, C. E.; CAMERON, D. M.; EVANS, J. M. M. Prevalence of gestational diabetes mellitus in Europe: A meta-analysis. **Diabetes Research and Clinical Practice**, v. 129, p. 173–181, 1 jul. 2017.

ELIZABETH, L. et al. Ultra-Processed Foods and Health Outcomes: A Narrative Review. **Nutrients**, v. 12, n. 7, p. 1955, 30 jun. 2020.

FALCÃO, I. R. et al. Factors associated with low birth weight at term: A population-based linkage study of the 100 million Brazilian cohort. **BMC Pregnancy and Childbirth**, v. 20, n. 1, 14 set. 2020.

FANG, F. et al. Risk factors for recurrent macrosomia and child outcomes. **World Journal of Pediatrics**, v. 15, n. 3, p. 289–296, 16 jun. 2019.

FARDET, A. et al. Current food classifications in epidemiological studies do not enable solid nutritional recommendations for preventing diet-related chronic diseases: The impact of food processing. **Advances in Nutrition**, v. 6, n. 6, p. 629–638, 2015.

FARDET, A. Characterization of the Degree of Food Processing in Relation With Its Health Potential and Effects. In: **Advances in Food and Nutrition Research**. [s.l.] Academic Press Inc., 2018. v. 85p. 79–129.

FERRERO, D. M. et al. Cross-Country individual participant analysis of 4.1 million singleton births in 5 countries with very high human development index confirms known associations but provides no biologic explanation for 2/3 of all preterm births. **PLoS ONE**, v. 11, n. 9, 1 set. 2016.

FLORES, T. R. et al. Gestational weight gain and postpartum weight retention: Data from the 2015 birth cohort in Pelotas, Rio Grande do sul State, Brazil. **Cadernos de Saude Publica**, v. 36, n. 11, 2020.

G. CLIFTON, R. et al. Design of lifestyle intervention trials to prevent excessive gestational weight gain in women with overweight or obesity. **Obesity**, v. 24, n. 2, p. 305–313, 1 fev. 2016.

GAIO, D. S. et al. HYPERTENSIVE DISORDERS IN PREGNANCY: FREQUENCY AND ASSOCIATED FACTORS IN A COHORT OF BRAZILIAN WOMEN. **Hypertension in Pregnancy**, v. 20, n. 3, p. 269–281, 7 jan. 2001.

GAROVIC, V. D. et al. **Hypertension in Pregnancy: Diagnosis, Blood Pressure Goals, and Pharmacotherapy: A Scientific Statement From the American Heart AssociationHypertension**Lippincott Williams and Wilkins, , 1 fev. 2022.

GOMES, C. D. B. et al. Consumption of ultra-processed foods in the third gestational trimester and increased weight gain: a Brazilian cohort study. **Public Health Nutrition**, v. 24, n. 11, p. 3304–3312, 20 ago. 2020.

GRACILIANO, N. G.; SILVEIRA, J. A. C. DA; OLIVEIRA, A. C. M. DE. The consumption of ultra-processed foods reduces overall quality of diet in pregnant women. **Cadernos de Saúde Pública**, v. 37, n. 2, 2021.

GRIEGER, J. A.; GRZESKOWIAK, L. E.; CLIFTON, V. L. Preconception dietary patterns in human pregnancies are associated with preterm delivery. **Journal of Nutrition**, v. 144, n. 7, p. 1075–1080, 2014.

GUAN, P. et al. Effect of maternal weight gain according to the Institute of Medicine recommendations on pregnancy outcomes in a Chinese population. **Journal of International Medical Research**, v. 47, n. 9, p. 4397–4412, 1 set. 2019.

GUIDOLINI MARTINELLI, K. et al. Prematuridade no Brasil entre 2012 e 2019: dados do Sistema de Informações sobre Nascidos Vivos. **Revista Brasileira de Estudos de População**, v. 38, p. 1–15, 8 out. 2021.

HAJIANFAR, H. et al. The association between major dietary patterns and pregnancy-related complications. **Archives of Iranian Medicine**, v. 21, n. 10, p. 443–451, 2018.

HAPO STUDY COOPERATIVE RESEARCH GROUP, METZGER BE, LOWE LP, DYER AR, TRIMBLE ER, CHAOVARINDR U, COUSTAN DR, HADDEN DR, MCCANCE DR, HOD M, MCINTYRE HD, OATS JJ, PERSSON B, ROGERS MS, S. D. Hyperglycemia and Adverse Pregnancy Outcomes. **New England Journal of Medicine**, v. 358, n. 19, p. 1991–2002, 8 maio 2008.

HARVEY, M. W. et al. Prepregnancy Body Mass Index, Gestational Weight Gain, and Odds of Cesarean Delivery in Hispanic Women. **Obesity**, v. 26, n. 1, p. 185–192, 1 jan. 2018.

HILL, B. et al. Health in preconception, pregnancy and postpartum global alliance: international network preconception research priorities for the prevention of maternal obesity and related pregnancy and long-term complications. **Journal of Clinical Medicine**, v. 8, n. 12, 1 dez. 2019.

HUG, L. et al. National, regional, and global levels and trends in neonatal mortality between 1990 and 2017, with scenario-based projections to 2030: a systematic analysis. **The Lancet Global Health**, v. 7, n. 6, p. e710–e720, 1 jun. 2019.

IBGE. **Pesquisa de Orçamentos Familiares 2017-2018: Análise do Consumo Alimentar Pessoal no Brasil**. Rio de Janeiro (RJ): [s.n.].

IBGE. **Pesquisa nacional de saúde 2019 : informações sobre domicílios, acesso e utilização dos serviços de saúde - Brasil, grandes regiões e unidades da federação**. Rio de Janeiro (RJ): IBGE, 2020b.

IDF. **IDF Diabetes Atlas 2021**. 10. ed. [s.l: s.n.].

IKEM, E. et al. Dietary patterns and the risk of pregnancy-associated hypertension in the Danish National Birth Cohort: a prospective longitudinal study. **BJOG: An International Journal of Obstetrics and Gynaecology**, v. 126, n. 5, p. 663–673, 2019.

JUUL, F. et al. Ultra-processed food consumption among US adults from 2001 to 2018. **The American Journal of Clinical Nutrition**, v. 115, n. 1, p. 211–221, 11 jan. 2022.

KAC, G. et al. Gestational weight gain charts: results from the Brazilian Maternal and Child Nutrition Consortium. **The American journal of clinical nutrition**, v. 113, n. 5, p. 1351–1360, 2021.

KASSEBAUM, N. J. et al. Global, regional, and national levels of maternal mortality, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. **The Lancet**, v. 388, n. 10053, p. 1775–1812, out. 2016.

KINSHELLA, M. L. W. et al. Maternal Dietary Patterns and Pregnancy Hypertension in Low- A nd Middle-Income Countries: A Systematic Review and Meta-analysis. **Advances in Nutrition**, v. 12, n. 6, p. 2387–2400, 2021.

KINTANAR, T. A. Obstetric Ultrasound. In: **Pfenninger and Fowler's Procedures for Primary Care**. 4. ed. [s.l.] Elsevier, 2020. p. 984–998.

KOYANAGI, A. et al. Macrosomia in 23 developing countries: an analysis of a multicountry, facility-based, cross-sectional survey. **The Lancet**, v. 381, n. 9865, p. 476–483, fev. 2013.

LAMYIAN, M. et al. Pre-pregnancy fast food consumption is associated with gestational diabetes mellitus among tehranian women. **Nutrients**, v. 9, n. 3, p. 2–10, 2017.

LEAL, L. F. et al. Maternal Mortality in Brazil, 1990 to 2019: a systematic analysis of the

Global Burden of Disease Study 2019. **Revista da Sociedade Brasileira de Medicina Tropical**, v. 55, n. suppl 1, 2022.

LEONE, A. et al. Pre-gestational consumption of ultra-processed foods and risk of gestational diabetes in a mediterranean cohort. The SUN project. **Nutrients**, v. 13, n. 7, 1 jul. 2021.

LI, G. et al. Incidence and Risk Factors of Gestational Diabetes Mellitus: A Prospective Cohort Study in Qingdao, China. **Frontiers in Endocrinology**, v. 11, 11 set. 2020.

LIU, L. et al. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. **The Lancet**, v. 388, n. 10063, p. 3027–3035, 17 dez. 2016.

LOUZADA, M. L. DA C. et al. Impact of ultra-processed foods on micronutrient content in the Brazilian diet. **Revista de Saude Publica**, v. 49, 2015.

MADZORERA, I. et al. Maternal dietary diversity and dietary quality scores in relation to adverse birth outcomes in Tanzanian women. **American Journal of Clinical Nutrition**, v. 112, n. 3, p. 695–706, 1 ago. 2020.

MAGALHÃES, E. I. DA S. et al. Prevalência e fatores associados ao ganho de peso gestacional excessivo em unidades de saúde do sudoeste da Bahia. **Revista Brasileira de Epidemiologia**, v. 18, n. 4, p. 858–869, 1 out. 2015.

MAHMASSANI, H. A. et al. Maternal diet quality during pregnancy and child cognition and behavior in a US cohort. **The American Journal of Clinical Nutrition**, v. 115, n. 1, p. 128–141, 11 jan. 2022.

MARTIN, C. L.; SOTRES-ALVAREZ, D.; SIEGA-RIZ, A. M. Maternal dietary patterns during the second trimester are associated with preterm birth. **Journal of Nutrition**, v. 145, n. 8, p. 1857–1864, 2015.

MARTÍNEZ STEELE, E. et al. The share of ultra-processed foods and the overall nutritional quality of diets in the US: evidence from a nationally representative cross-sectional study. **Population Health Metrics**, v. 15, n. 1, p. 6, 14 dez. 2017.

MARTINI, D. et al. Ultra-Processed Foods and Nutritional Dietary Profile: A Meta-Analysis of Nationally Representative Samples. **Nutrients**, v. 13, n. 10, p. 3390, 27 set. 2021.

MARTINS, A. P. B. et al. Participacao crescente de produtos ultraprocessados na dieta brasileira (1987-2009). **Revista de Saúde Pública**, v. 47, n. 4, p. 656–665, ago. 2013.

MCGOWAN, J. et al. PRESS Peer Review of Electronic Search Strategies: 2015 Guideline Statement. **Journal of Clinical Epidemiology**, v. 75, p. 40–46, jul. 2016.

MENDONÇA, E. L. S. S. et al. Premature birth, low birth weight, small for gestational age and chronic non-communicable diseases in adult life: A systematic review with meta-analysis. **Early Human Development**, v. 149, p. 105154, 2020.

METZGER, B. E.; BUCHANAN, T. A. Gestational Diabetes. In: COWIE CC,

CASAGRANDE SS, MENKE A, ET AL., EDITORS (Ed.). . **Diabetes in America**. 3. ed. Bethesda (MD): National Institute of Diabetes and Digestive and Kidney Diseases (US), 2018.

MIELE, M. J. et al. The food patterns of a multicenter cohort of Brazilian nulliparous pregnant women. **Scientific Reports**, v. 11, n. 1, 1 dez. 2021.

MIELE, M. J. O. et al. Profile of calories and nutrients intake in a Brazilian multicenter study of nulliparous women. **International Journal of Gynecology and Obstetrics**, v. 156, n. 1, p. 34–41, 2022.

MIRANDA, C.; SOUZA, R. C. V. E; SANTOS, L. C. DOS. Influência do consumo de alimentos ultraprocessados durante a gestação nas medidas antropométricas do bebê, do nascimento ao primeiro ano de vida: uma revisão sistemática. **Revista Brasileira de Saúde Materno Infantil**, v. 21, n. 1, p. 9–26, 2021.

MONTEIRO, C. A. et al. A new classification of foods based on the extent and purpose of their processing. **Cadernos de Saúde Pública**, v. 26, n. 11, 2010.

MONTEIRO, C. A. et al. **Ultra-processed products are becoming dominant in the global food systemObesity Reviews**, nov. 2013.

MONTEIRO, C. A. et al. **Food classification. Public health NOVA. The star shines bright**. 2016

MONTEIRO, C. A. et al. **Ultra-processed foods: What they are and how to identify themPublic Health Nutrition**Cambridge University Press, , 1 abr. 2019.

MONTESCHIO, L. V. C. et al. Ganho de peso gestacional excessivo no Sistema Único de Saúde. **Acta Paulista de Enfermagem**, v. 34, 2021.

MOREIRA, R. S.; MAGALHÃES, L. C.; ALVES, C. R. L. **Effect of preterm birth on motor development, behavior, and school performance of schoola-age children: A systematic reviewJornal de Pediatria**Elsevier Editora Ltda, , 2014.

NANSEL, T. R. et al. Greater Ultra-Processed Food Intake during Pregnancy and Postpartum Is Associated with Multiple Aspects of Lower Diet Quality. **Nutrients**, v. 14, n. 19, p. 3933, 22 set. 2022.

NASCIMENTO, M. et al. Trends in the Prevalence of Live Macrosomic Newborns According to Gestational Age Strata, in Brazil, 2001–2010, and 2012–2014. **Revista Brasileira de Ginecologia e Obstetrícia / RBGO Gynecology and Obstetrics**, v. 39, n. 08, p. 376–383, 7 ago. 2017.

NEGRATO, C. A. et al. **Open Access REVIEW BioMed CentralDiabetology & Metabolic Syndrome**. [s.l: s.n.]. Disponível em: <http://www.dmsjournal.com/content/2/1/27>.

OLIVEIRA, P. G. DE et al. Impacts of Consumption of Ultra-Processed Foods on the Maternal-Child Health: A Systematic Review. **Frontiers in Nutrition**, v. 9, 13 maio 2022.

OUZZANI, M. et al. Rayyan—a web and mobile app for systematic reviews. **Systematic Reviews**, v. 5, n. 1, p. 210, 5 dez. 2016.

PAGLIAI, G. et al. **Consumption of ultra-processed foods and health status: A systematic review and meta-AnalysisBritish Journal of Nutrition**Cambridge University Press, , 14 fev. 2021.

PAIXAO, E. S. et al. Risk of mortality for small newborns in Brazil, 2011-2018: A national birth cohort study of 17.6 million records from routine register-based linked data. **The Lancet Regional Health - Americas**, v. 3, p. 100045, nov. 2021.

PARISI, F.; LAORETI, A.; CETIN, I. Multiple Micronutrient Needs in Pregnancy in Industrialized Countries. **Annals of Nutrition and Metabolism**, v. 65, n. 1, p. 13–21, 2014.

PAULINO, D. S. M. et al. Dietary intake profile in high-risk pregnant women according to the degree of food processing. **Journal of Maternal-Fetal and Neonatal Medicine**, v. 0, n. 0, p. 1–7, 2020.

POLSKY, J. Y.; MOUBARAC, J. C.; GARRIGUET, D. Consumption of ultra-processed foods in Canada. **Health reports**, v. 31, n. 11, p. 3–15, 18 nov. 2020.

POON, L. C. et al. The first-trimester of pregnancy – A window of opportunity for prediction and prevention of pregnancy complications and future life. **Diabetes Research and Clinical Practice**, v. 145, p. 20–30, 2018.

RAMOS FILHO, F. L.; ANTUNES, C. M. DE F. Hypertensive Disorders: Prevalence, Perinatal Outcomes and Cesarean Section Rates in Pregnant Women Hospitalized for Delivery. **Revista Brasileira de Ginecologia e Obstetrícia / RBGO Gynecology and Obstetrics**, v. 42, n. 11, p. 690–696, 30 nov. 2020.

RANA, S. et al. Preeclampsia: Pathophysiology, Challenges, and Perspectives. **Circulation Research**, v. 124, n. 7, p. 1094–1112, 29 mar. 2019.

RASMUSSEN, M. A. et al. Characterization of dietary patterns in the Danish National Birth Cohort in relation to preterm birth. **PLoS ONE**, v. 9, n. 4, 2014.

RAUBER, F. et al. Ultra-processed foods and excessive free sugar intake in the UK: A nationally representative cross-sectional study. **BMJ Open**, v. 9, n. 10, 2019.

ROHATGI, K. W. et al. Relationships between consumption of ultra-processed foods, gestational weight gain and neonatal outcomes in a sample of US pregnant women. **PeerJ**, v. 2017, n. 12, 2017.

ROJHANI, A. et al. Dietary quality of pregnant women participating in the special supplemental nutrition program for women, infants, and children. **International Journal of Environmental Research and Public Health**, v. 18, n. 16, 2 ago. 2021.

SAID, A. S.; MANJI, K. P. Risk factors and outcomes of fetal macrosomia in a tertiary centre in Tanzania: A case-control study. **BMC Pregnancy and Childbirth**, v. 16, n. 1, 2016.

SARTORELLI, D. S. et al. Relationship between minimally and ultra-processed food intake during pregnancy with obesity and gestational diabetes mellitus. **Cadernos de Saude Publica**, v. 35, n. 4, p. 1–10, 2019.

SBD. **Diretrizes da Sociedade Brasileira de Diabetes 2019-2020**. [s.l.] CLANNAD: Editora Científica, 2019.

SUN, Y. et al. Effects of pre-pregnancy body mass index and gestational weight gain on maternal and infant complications. **BMC Pregnancy and Childbirth**, v. 20, n. 1, 6 jul. 2020.

TCHAMO, M. E.; PRISTA, A.; LEANDRO, C. G. Low birth weight, very low birth weight and extremely low birth weight in African children aged between 0 and 5 years old: a systematic review. **Journal of Developmental Origins of Health and Disease**, v. 7, n. 4, p. 408–415, 13 ago. 2016.

TENG, H. et al. Gestational systolic blood pressure trajectories and risk of adverse maternal and perinatal outcomes in Chinese women. **BMC Pregnancy and Childbirth**, v. 21, n. 1, 1 dez. 2021.

TURKMEN, S.; JOHANSSON, S.; DAHMOUN, M. Foetal Macrosomia and Foetal-Maternal Outcomes at Birth. **Journal of Pregnancy**, v. 2018, 2018.

VITOLO, M. R. **Nutrição: Da Gestação ao Envelhecimento**. 2. ed. [s.l.] Editora Rubio, 2014.

VIVIAN UKAH, U. et al. Association between gestational weight gain and severe adverse birth outcomes in Washington State, US: A population-based retrospective cohort study, 2004-2013. **PLoS Medicine**, v. 16, n. 12, 2019.

WAGURA, P. et al. Prevalence and factors associated with preterm birth at kenyatta national hospital. **BMC Pregnancy and Childbirth**, v. 18, n. 1, 19 abr. 2018.

WALDENSTRÖM, U. et al. Adverse pregnancy outcomes related to advanced maternal age compared with smoking and being overweight. **Obstetrics and gynecology**, v. 123, n. 1, p. 104–112, jan. 2014.

WANG, L. et al. Association of ultra-processed food consumption with colorectal cancer risk among men and women: results from three prospective US cohort studies. **BMJ**, p. e068921, 31 ago. 2022.

WHO. **Obesity : preventing and managing the global epidemic : report of a WHO consultation**. Geneva: [s.n.].

WHO. **Global nutrition targets 2025: low birth weight policy brief**. [s.l: s.n.]. Disponível em: <https://www.who.int/publications/i/item/WHO-NMH-NHD-14.5>.

WHO. **Good maternal nutrition : the best start in life**. [s.l.] WHO Regional Office for Europe, 2016.

WHO. **Low birth weight**. Disponível em: <https://www.who.int/data/nutrition/nlis/info/low-

birth-weight>. Acesso em: 4 mar. 2022.

WIDEN, E. M. et al. Excessive gestational weight gain is associated with long-term body fat and weight retention at 7 y postpartum in African American and Dominican mothers with underweight, normal, and overweight prepregnancy BMI. **American Journal of Clinical Nutrition**, v. 102, n. 6, p. 1460–1467, 1 dez. 2015.

YEE, L. M. et al. Quality of periconceptional dietary intake and maternal and neonatal outcomes. **American Journal of Obstetrics and Gynecology**, v. 223, n. 1, p. 121.e1-121.e8, 2020.

ZAREEI, S. et al. Dietary pattern in patients with preeclampsia in Fasa, Iran. **Shiraz E Medical Journal**, v. 20, n. 11, 2019.

ZHANG, J.; YU, K. F. Special Communication What's the Relative Risk? A Method of Correcting the Odds Ratio in Cohort Studies of Common Outcomes. **JAMA**, v. 280, n. 19, 1998.

ZHAO, R. et al. Maternal pre-pregnancy body mass index, gestational weight gain influence birth weight. **Women and Birth**, v. 31, n. 1, p. e20–e25, 1 fev. 2018.

ZOBEL, E. H. et al. Global Changes in Food Supply and the Obesity Epidemic. **Current obesity reports**, v. 5, n. 4, p. 449–455, 2016.

Apêndice 1 - *PRESS Guideline* — Search Submission & Peer Review Assessment

SEARCH SUBMISSION: THIS SECTION TO BE FILLED IN BY THE SEARCHER

Searcher: Walkyria (R1) e Erika (R2)	**Email:** walkyria.paula@hotmail.com erikapatriota.nut@gmail.com
Date submitted 17th May 2021	**Date requested by:**

Systematic Review Title:

Consumption of ultra-processed and unhealthy foods and maternal/neonatal outcomes.

This search strategy is:

X	My PRIMARY (core) database strategy — First time submitting a strategy for search question and database
	My PRIMARY (core) strategy — Follow-up review NOT the first time submitting a strategy for search question and database. If this is a response to peer review, itemize the changes made to the review suggestions
	SECONDARY search strategy— First time submitting a strategy for search question and database
	SECONDARY search strategy — NOT the first time submitting a strategy for search question and database. If this is a response to peer review, itemize the changes made to the review suggestions

Database

(i.e., MEDLINE,CINAHL…):

MEDLINE

Interface

(i.e., Ovid, EBSCO, PUBMED…):

PUBMED

Research Question

(Describe the purpose of the search)

Is consumption of ultra-processed and unhealthy foods during pregnancy associated with negative maternal/neonatal outcomes?

PI(E)COS Format

(Outline the PICOs for your question — i.e., Patient, Index test, Reference standard, Outcome,and Study Design — as applicable)

P	Pregnant women of all trimesters
I/E	Ultra-processed and unhealthy foods consumption
C	-
O	Maternal and neonatal outcomes (i.e. gestational hypertension and diabetes, gestational weight gain, birth size, prematurity)
S	Observational studies (cross-sectional, longitudinal, case-control)

Inclusion Criteria

(List criteria such as age groups, study designs, etc., to be included)

1	Pregnant women of all trimesters
2	English language and foreign language publications with an English abstract
3	Not restricted by country
4	

Exclusion Criteria

(List criteria such as study designs, date limits, etc., to be excluded)

1	letters to editors, reviews, personal opinions, book chapters, commentaries, editorials and any publication without primary data.
2	Pregnant women with comorbidities prior to pregnancy
3	Animal studies

Was a search filter applied?

Yes ( ) No (x)

If YES, which one(s) (e.g., Cochrane RCT filter, PubMed Clinical Queries filter)? Provide thesource if this is a published filter. *[mandatory if YES to previous question]*

Other notes or comments you feel would be useful for the peer reviewer?

Please copy and paste your search strategy here, exactly as run, including the number of hitsper line. *[mandatory]*

	DECS OU MESH	LINHAS DA ESTRATÉGIA	DATA DA BUSCA E NÚMERO DE ESTUDOS LOCALIZADOS
P #1	**Pregnancy (termo mesh)** Pregnancies Gestation Pregnan* **Pregnant women (termo mesh)** Pregnant woman Woman, pregnant Women, pregnant Maternal Antenatal **"Maternal Exposure" (termo mesh)**	((((((((((pregnancy[MeSH Terms]) OR (pregnancies)) OR (gestation)) OR (pregnan*)) OR ("pregnant women"[MeSH Terms])) OR ("pregnant woman")) OR ("Woman, pregnant")) OR ("Women, pregnant")) OR (maternal)) OR (antenatal)) OR ("maternal exposure"[MeSH Terms])	1.312.515
AND			

E #2	“Ultraprocessed food” OR “Ultraprocessed foods” OR “Ultra-processed food” OR “Ultra-processed foods” OR “Industrialized food” OR “Processed food” OR “Ready-to-eat meal” OR “ready-to-eat food” OR “Ready-Prepared Food” OR “fast food” OR “non-home-prepared food” OR “Sodium intake” OR “salt intake” OR “salt food” OR “Salty food” OR “High-fat food” OR “high-fat diet” OR “high-sucrose” OR “high-salt” OR “High sodium food” OR “soft drink” OR “highly processed foods” OR “refined food” OR “high sugar” OR “junk food” OR “sugar-sweetened beverage” OR “unhealthy eating” OR “unhealthy diet” OR “unhealthy nutrition” OR “Unhealthy dietary habits” OR “Unhealthy dietary patterns” OR “unhealthy dietary behaviors” OR “unhealthy food” OR “diet quality” OR “dietary energy density” OR “High energy density” OR “poor diet” “dietary quality” “processed meat” “western diet”	((((((((((((((((((((((((((((((((((((((("Ultraprocessed food") OR ("Ultraprocessed foods")) OR ("Ultra-processed food")) OR ("Ultra-processed foods")) OR ("Industrialized food")) OR ("Processed food")) OR ("Ready-to-eat meal")) OR ("ready-to-eat food")) OR ("Ready-Prepared Food")) OR ("fast food")) OR ("non-home-prepared food")) OR ("Sodium intake")) OR ("salt intake")) OR ("salt food")) OR ("Salty food")) OR ("High-fat food")) OR ("high-fat diet")) OR ("high-sucrose")) OR ("high-salt")) OR ("High sodium food")) OR ("soft drink")) OR ("highly processed foods")) OR ("refined food")) OR ("high sugar")) OR ("junk food")) OR ("sugar-sweetened beverage")) OR ("sugar-sweetened beverages")) OR ("unhealthy eating")) OR ("unhealthy diet")) OR ("unhealthy nutrition")) OR ("Unhealthy dietary habits")) OR ("Unhealthy dietary patterns")) OR ("unhealthy dietary behaviors")) OR ("unhealthy food")) OR ("diet quality")) OR ("dietary energy density")) OR ("High energy density")) OR ("poor diet")) OR ("dietary quality")) OR ("processed meat")) OR ("western diet")) OR (snacks)) OR ("processing pattern")) OR ("added sugar")) OR ("refined grain")	77.001
AND			

O #3	“Perinatal outcome” OR “perinatal outcomes” OR “gestational weight gain” OR “pregnancy weight gain” OR “birth outcomes” OR “birth outcome” OR “Birth weight” OR “Hypertensive disorders” OR "Pregnancy-Induced Hypertension" OR “Gestational diabetes” OR “Blood pressure” OR hypertension OR “Gestational Hypertension” OR “Preterm birth” OR “Preterm delivery” OR “Premature birth” OR “prematurity” OR “fetal growth” OR “Pregnancy complications” OR “Pregnancy outcomes” OR “pregnancy outcome” OR “outcome of pregnancy” OR “glycemic outcomes” OR “birth size” OR Birthweight OR “Neonatal weight” OR “Newborn weight”	((((((((((((((((((((((((("Perinatal outcome") OR ("perinatal outcomes")) OR ("gestational weight gain")) OR ("pregnancy weight gain")) OR ("birth outcomes")) OR ("birth outcome")) OR ("Birth weight")) OR ("Hypertensive disorders")) OR ("Pregnancy-Induced Hypertension")) OR ("Gestational diabetes")) OR ("Blood pressure")) OR (hypertension)) OR ("Gestational Hypertension")) OR ("Preterm birth")) OR ("Preterm delivery")) OR ("Premature birth")) OR ("prematurity")) OR ("fetal growth")) OR ("Pregnancy complications")) OR ("Pregnancy outcomes")) OR ("pregnancy outcome")) OR ("outcome of pregnancy")) OR ("glycemic outcomes")) OR ("birth size")) OR (Birthweight)) OR ("Neonatal weight")) OR ("Newborn weight")) OR ("Small-for-gestational age")	1.193.875
ESTRATÉGIA FINAL			
#1 AND #2 AND #3			1.435

PEER REVIEW ASSESSMENT: THIS SECTION TO BE FILLED IN BY THE REVIEWER

Reviewer: Muriel Gubert	**Email:** murielgubert@gmail.com
Date completed: 21st, May	

1. TRANSLATION

A -–No revisions	**x**
B -– Revision(s) suggested	
C -– Revision(s) required	

If “B” or “C,” please provide an explanation or example:

2. BOOLEAN AND PROXIMITY OPERATORS

A -–No revisions	**x**
B -– Revision(s) suggested	
C -– Revision(s) required	

If “B” or “C,” please provide an explanation or example:

3. SUBJECT HEADINGS

A -–No revisions	**x**
B -– Revision(s) suggested	
C -– Revision(s) required	

If “B” or “C,” please provide an explanation or example:

4. TEXT WORD SEARCHING

A -–No revisions	
B -– Revision(s) suggested	**x**
C -– Revision(s) required	

If “B” or “C,” please provide an explanation or example:

“dietary energy density” OR “High energy density” OR “western diet” are not suitable terms for this search. E#2 - Strategy Lines: it seems to be incomplete. More terms are necessary.

5. SPELLING, SYNTAX, AND LINE NUMBERS

A -–No revisions	**x**
B -– Revision(s) suggested	
C -– Revision(s) required	

If “B” or “C,” please provide an explanation or example:

6. LIMITS AND FILTERS

A -–No revisions	**x**
B -– Revision(s) suggested	
C -– Revision(s) required	

If “B” or “C,” please provide an explanation or example:

OVERALL EVALUATION
(Note: If one or more “revision required” is noted above, the response below must be “revisions required”.)

A -–No revisions	
B -– Revision(s) suggested	**x**
C -– Revision(s) required	

Additional comments:

Overall it is a good search strategy, but E#2 needs improvement. I believe there are missing terms.

Apêndice 2 - Database search strategy for systematic review of the consumption of ultra-processed and perinatal outcomes

DATABASE	**SEARCH** (date)
MEDLINE	("pregnancy"[MeSH Terms] OR ("pregnancy"[MeSH Terms] OR "pregnancy"[All Fields] OR "pregnancies"[All Fields] OR "pregnancy s"[All Fields]) OR ("gestate"[All Fields] OR "gestated"[All Fields] OR "gestates"[All Fields] OR "gestating"[All Fields] OR "gestational"[All Fields] OR "gestations"[All Fields] OR "pregnancy"[MeSH Terms] OR "pregnancy"[All Fields] OR "gestation"[All Fields]) OR "pregnan*"[All Fields] OR "pregnant women"[MeSH Terms] OR "pregnant woman"[All Fields] OR "woman pregnant"[All Fields] OR "women pregnant"[All Fields] OR ("maternally"[All Fields] OR "maternities"[All Fields] OR "maternity"[All Fields] OR "mothers"[MeSH Terms] OR "mothers"[All Fields] OR "maternal"[All Fields]) OR ("antenatal"[All Fields] OR "antenatally"[All Fields]) OR "maternal exposure"[MeSH Terms]) AND ("fast foods"[MeSH Terms] OR "fast food"[All Fields] OR "Ultraprocessed food"[All Fields] OR "Ultraprocessed foods"[All Fields] OR "Ultra-processed food"[All Fields] OR "Ultra-processed foods"[All Fields] OR "Industrialized food"[All Fields] OR "Processed food"[All Fields] OR "Ready-to-eat meal"[All Fields] OR "ready-to-eat food"[All Fields] OR "Ready-Prepared Food"[All Fields] OR "non-home-prepared food"[All Fields] OR "Sodium intake"[All Fields] OR "salt intake"[All Fields] OR "salt food"[All Fields] OR "Salty food"[All Fields] OR "diet, high fat"[MeSH Terms] OR "high-fat diet"[All Fields] OR "High-fat food"[All Fields] OR "high-sucrose"[All Fields] OR "high-salt"[All Fields] OR "High sodium food"[All Fields] OR "highly processed foods"[All Fields] OR "refined food"[All Fields] OR "high sugar"[All Fields] OR "junk food"[All Fields] OR "sugar-sweetened beverages"[MeSH Terms] OR "sugar-sweetened beverages"[All Fields] OR "soft drink"[All Fields] OR "unhealthy eating"[All Fields] OR "unhealthy diet"[All Fields] OR "unhealthy nutrition"[All Fields] OR "Unhealthy dietary habits"[All Fields] OR "Unhealthy dietary patterns"[All Fields] OR "unhealthy dietary behaviors"[All Fields] OR "unhealthy food"[All Fields] OR "diet quality"[All Fields] OR "dietary energy density"[All Fields] OR "High energy density"[All Fields] OR "poor diet"[All Fields] OR "dietary quality"[All Fields] OR "processed meat"[All Fields] OR "diet, western"[MeSH Terms] OR "western diets"[All Fields]) AND ("Perinatal outcome"[All Fields] OR "perinatal outcomes"[All Fields] OR "Pregnancy outcomes"[All Fields] OR "pregnancy outcome"[All Fields] OR "outcome of pregnancy"[All Fields] OR "gestational weight gain"[MeSH Terms] OR "pregnancy weight gain"[All Fields] OR "birth outcomes"[All Fields] OR "birth outcome"[All Fields] OR "birth weight"[MeSH Terms] OR ("birth weight"[MeSH Terms] OR ("birth"[All Fields] AND "weight"[All Fields]) OR "birth weight"[All Fields] OR "birthweight"[All Fields] OR "birthweights"[All Fields]) OR "Neonatal weight"[All Fields] OR "Newborn weight"[All Fields] OR "birth size"[All Fields] OR "hypertension, pregnancy induced"[MeSH Terms] OR "hypertension, pregnancy induced"[MeSH Terms] OR "Hypertensive disorders"[All Fields] OR "Blood pressure"[All Fields] OR "Hypertension"[All Fields] OR "diabetes, gestational"[MeSH Terms] OR "glycemic outcomes"[All Fields] OR "premature birth"[MeSH Terms] OR "Preterm birth"[All Fields] OR "Preterm delivery"[All Fields] OR "prematurity"[All Fields] OR "fetal growth"[All Fields] OR "pregnancy complications"[MeSH Terms])
EMBASE	(pregnancy OR pregnancies OR gestation OR pregnan* OR 'pregnant women' OR 'pregnant woman' OR 'woman, pregnant' OR 'women, pregnant' OR maternal OR antenatal OR 'maternal exposure') AND ('ultraprocessed food' OR 'ultraprocessed foods' OR 'ultra-processed food' OR 'ultra-processed foods' OR 'industrialized food' OR 'processed food' OR 'ready-to-eat meal' OR 'ready-to-eat food' OR 'ready-prepared food' OR 'fast food' OR 'non-home-prepared food' OR 'sodium intake' OR 'salt intake' OR 'salt food' OR 'salty food' OR 'high-fat food' OR 'high-fat diet' OR 'high-sucrose' OR 'high-salt' OR 'high sodium food' OR 'soft drink' OR 'highly processed foods' OR 'refined food' OR 'high sugar' OR 'junk food' OR 'sugar-sweetened beverage' OR 'sugar-sweetened beverages' OR 'unhealthy eating' OR 'unhealthy diet' OR 'unhealthy nutrition' OR 'unhealthy dietary habits' OR 'unhealthy dietary patterns' OR 'unhealthy dietary behaviors' OR 'unhealthy food' OR 'diet quality' OR 'dietary energy density' OR 'high energy density' OR 'poor diet' OR 'dietary quality' OR 'processed meat' OR 'western diet' OR snacks OR 'processing pattern' OR 'added sugar' OR 'refined grain') AND ('perinatal outcome' OR 'perinatal outcomes' OR 'gestational weight

	gain' OR 'pregnancy weight gain' OR 'birth outcomes' OR 'birth outcome' OR 'birth weight' OR 'hypertensive disorders' OR 'pregnancy-induced hypertension' OR 'gestational diabetes' OR 'blood pressure' OR hypertension OR 'gestational hypertension' OR 'preterm birth' OR 'preterm delivery' OR 'premature birth' OR prematurity OR 'fetal growth' OR 'pregnancy complications' OR 'pregnancy outcomes' OR 'pregnancy outcome' OR 'outcome of pregnancy' OR 'glycemic outcomes' OR 'birth size' OR birthweight OR 'neonatal weight' OR 'newborn weight' OR 'small-for-gestational age')
LILACS	(pregnancy OR pregnancies OR gestation OR pregnan* OR 'pregnant women' OR 'pregnant woman' OR 'woman, pregnant' OR 'women, pregnant' OR maternal OR antenatal OR 'maternal exposure') AND ('ultraprocessed food' OR 'ultraprocessed foods' OR 'ultra-processed food' OR 'ultra-processed foods' OR 'industrialized food' OR 'processed food' OR 'ready-to-eat meal' OR 'ready-to-eat food' OR 'ready-prepared food' OR 'fast food' OR 'non-home-prepared food' OR 'sodium intake' OR 'salt intake' OR 'salt food' OR 'salty food' OR 'high-fat food' OR 'high-fat diet' OR 'high-sucrose' OR 'high-salt' OR 'high sodium food' OR 'soft drink' OR 'highly processed foods' OR 'refined food' OR 'high sugar' OR 'junk food' OR 'sugar-sweetened beverage' OR 'sugar-sweetened beverages' OR 'unhealthy eating' OR 'unhealthy diet' OR 'unhealthy nutrition' OR 'unhealthy dietary habits' OR 'unhealthy dietary patterns' OR 'unhealthy dietary behaviors' OR 'unhealthy food' OR 'diet quality' OR 'dietary energy density' OR 'high energy density' OR 'poor diet' OR 'dietary quality' OR 'processed meat' OR 'western diet' OR snacks OR 'processing pattern' OR 'added sugar' OR 'refined grain') AND ('perinatal outcome' OR 'perinatal outcomes' OR 'gestational weight gain' OR 'pregnancy weight gain' OR 'birth outcomes' OR 'birth outcome' OR 'birth weight' OR 'hypertensive disorders' OR 'pregnancy-induced hypertension' OR 'gestational diabetes' OR 'blood pressure' OR hypertension OR 'gestational hypertension' OR 'preterm birth' OR 'preterm delivery' OR 'premature birth' OR prematurity OR 'fetal growth' OR 'pregnancy complications' OR 'pregnancy outcomes' OR 'pregnancy outcome' OR 'outcome of pregnancy' OR 'glycemic outcomes' OR 'birth size' OR birthweight OR 'neonatal weight' OR 'newborn weight' OR 'small-for-gestational age')
SCOPUS	*((* TITLE-ABS-KEY *(* pregnancy *) OR* TITLE-ABS-KEY *(* pregnancies *) OR* TITLE-ABS-KEY *(* gestation *) OR* TITLE-ABS-KEY *(* pregnan* *) OR* TITLE-ABS-KEY *(* pregnant AND women *) OR* TITLE-ABS-KEY *(* "Pregnant woman" *) OR* TITLE-ABS-KEY *(* "Woman, pregnant" *) OR* TITLE-ABS-KEY *(* "Women, pregnant" *) OR* TITLE-ABS-KEY *(* maternal *) OR* TITLE-ABS-KEY *(* antenatal *) OR* TITLE-ABS-KEY *(* "Maternal exposure" *))) AND ((* TITLE-ABS-KEY *(* "Perinatal outcome" *) OR* TITLE-ABS-KEY *(* "perinatal outcomes" *) OR* TITLE-ABS-KEY *(* "gestational weight gain" *) OR* TITLE-ABS-KEY *(* "pregnancy weight gain" *) OR* TITLE-ABS-KEY *(* "birth outcomes" *) OR* TITLE-ABS-KEY *(* "birth outcome" *) OR* TITLE-ABS-KEY *(* "Birth weight" *) OR* TITLE-ABS-KEY *(* "Hypertensive disorders" *) OR* TITLE-ABS-KEY *(* "Pregnancy-Induced Hypertension" *) OR* TITLE-ABS-KEY *(* "Gestational diabetes" *) OR* TITLE-ABS-KEY *(* "Blood pressure" *) OR* TITLE-ABS-KEY *(* hypertension *) OR* TITLE-ABS-KEY *(* "Gestational Hypertension" *) OR* TITLE-ABS-KEY *(* "Preterm birth" *) OR* TITLE-ABS-KEY *(* "Preterm delivery" *) OR* TITLE-ABS-KEY *(* "Premature birth" *) OR* TITLE-ABS-KEY *(* prematurity *) OR* TITLE-ABS-KEY *(* "fetal growth" *) OR* TITLE-ABS-KEY *(* "Pregnancy complications" *) OR* TITLE-ABS-KEY *(* "Pregnancy outcomes" *) OR* TITLE-ABS-KEY *(* "pregnancy outcome" *) OR* TITLE-ABS-KEY *(* "outcome of pregnancy" *) OR* TITLE-ABS-KEY *(* "glycemic outcomes" *) OR* TITLE-ABS-KEY *(* "birth size" *) OR* TITLE-ABS-KEY *(* birthweight *) OR* TITLE-ABS-KEY *(* "Neonatal weight" *) OR* TITLE-ABS-KEY *(* "Newborn weight" *) OR* TITLE-ABS-KEY *(* "Small-for-gestational age" *))) AND ((* TITLE-ABS-KEY *(* ultraprocessed AND food *) OR* TITLE-ABS-KEY *(* "Ultraprocessed foods" *) OR* TITLE-ABS-KEY *(* "Ultra-processed food" *) OR* TITLE-ABS-KEY *(* "Ultra-processed foods" *) OR* TITLE-ABS-KEY *(* "Industrialized food" *) OR* TITLE-ABS-KEY *(* "Processed food" *) OR* TITLE-ABS-KEY *(* "Ready-to-eat meal" *) OR* TITLE-ABS-KEY *(* "ready-to-eat food" *) OR* TITLE-ABS-KEY *(* "Ready-Prepared Food" *) OR* TITLE-ABS-KEY *(* "fast food" *) OR* TITLE-ABS-KEY *(* "non-home-prepared food" *) OR* TITLE-ABS-KEY *(* "Sodium intake" *) OR* TITLE-ABS-KEY *(* "salt intake" *) OR* TITLE-ABS-KEY *(* "salt food" *) OR* TITLE-ABS-KEY *(* "Salty food" *) OR* TITLE-ABS-KEY *(* "High-fat food" *) OR* TITLE-ABS-KEY *(* "high-fat diet" *) OR* TITLE-ABS-KEY *(* "high-

	sucrose") *OR* TITLE-ABS-KEY ("high-salt") *OR* TITLE-ABS-KEY ("High sodium food") *OR* TITLE-ABS-KEY ("soft drink") *OR* TITLE-ABS-KEY ("highly processed foods") *OR* TITLE-ABS-KEY ("refined food") *OR* TITLE-ABS-KEY ("high sugar") *OR* TITLE-ABS-KEY ("junk food") *OR* TITLE-ABS-KEY ("sugar-sweetened beverage") *OR* TITLE-ABS-KEY ("sugar-sweetened beverages") *OR* TITLE-ABS-KEY ("unhealthy eating") *OR* TITLE-ABS-KEY ("unhealthy diet") *OR* TITLE-ABS-KEY ("unhealthy nutrition") *OR* TITLE-ABS-KEY ("Unhealthy dietary habits") *OR* TITLE-ABS-KEY ("Unhealthy dietary patterns") *OR* TITLE-ABS-KEY ("unhealthy dietary behaviors") *OR* TITLE-ABS-KEY ("unhealthy food") *OR* TITLE-ABS-KEY ("diet quality") *OR* TITLE-ABS-KEY ("dietary energy density") *OR* TITLE-ABS-KEY ("High energy density") *OR* TITLE-ABS-KEY ("poor diet") *OR* TITLE-ABS-KEY ("dietary quality") *OR* TITLE-ABS-KEY ("processed meat") *OR* TITLE-ABS-KEY ("western diet") *OR* TITLE-ABS-KEY (snacks) *OR* TITLE-ABS-KEY ("processing pattern") *OR* TITLE-ABS-KEY ("added sugar") *OR* TITLE-ABS-KEY ("refined grain")))
WEB OF SCIENCE	Pregnancy OR Pregnancies OR Gestation OR Pregnan* OR "Pregnant women" OR "Pregnant woman" OR "Woman, pregnant" OR "Women, pregnant" OR Maternal OR Antenatal OR "Maternal exposure" (All Fields) AND "Ultraprocessed food" OR "Ultraprocessed foods" OR "Ultra-processed food" OR "Ultra-processed foods" OR "Industrialized food" OR "Processed food" OR "Ready-to-eat meal" OR "ready-to-eat food" OR "Ready-Prepared Food" OR "fast food" OR "non-home-prepared food" OR "Sodium intake" OR "salt intake" OR "salt food" OR "Salty food" OR "High-fat food" OR "high-fat diet" OR "high-sucrose" OR "high-salt" OR "High sodium food" OR "soft drink" OR "highly processed foods" OR "refined food" OR "high sugar" OR "junk food" OR "sugar-sweetened beverage" OR "sugar-sweetened beverages" OR "unhealthy eating" OR "unhealthy diet" OR "unhealthy nutrition" OR "Unhealthy dietary habits" OR "Unhealthy dietary patterns" OR "unhealthy dietary behaviors" OR "unhealthy food" OR "diet quality" OR "dietary energy density" OR "High energy density" OR "poor diet" OR "dietary quality" OR "processed meat" OR "western diet" OR Snacks OR "processing pattern" OR "added sugar" OR "refined grain" (All Fields) AND "Perinatal outcome" OR "perinatal outcomes" OR "gestational weight gain" OR "pregnancy weight gain" OR "birth outcomes" OR "birth outcome" OR "Birth weight" OR "Hypertensive disorders" OR "Pregnancy-Induced Hypertension" OR "Gestational diabetes" OR "Blood pressure" OR hypertension OR "Gestational Hypertension" OR "Preterm birth" OR "Preterm delivery" OR "Premature birth" OR prematurity OR "fetal growth" OR "Pregnancy complications" OR "Pregnancy outcomes" OR "pregnancy outcome" OR "outcome of pregnancy" OR "glycemic outcomes" OR "birth size" OR Birthweight OR "Neonatal weight" OR "Newborn weight" OR "Small-for-gestational age" (All Fields)
GOOGLE SCHOLAR	Pregnancy OR "Pregnant women" OR "Pregnant woman" AND "Ultraprocessed food" OR "Ultra-processed foods" OR "Industrialized food" OR "Processed food" OR "Sodium intake" OR "salt intake" OR "High-fat food" OR "high-sucrose" OR "soft drink" OR "junk food" OR "sugar-sweetened beverage" OR "unhealthy diet" OR "Unhealthy dietary habits" OR "Unhealthy dietary patterns" OR "unhealthy dietary behaviors" OR "processed meat" OR "western diet" OR Snacks AND "Perinatal outcome" OR "gestational weight gain" OR "birth outcomes" OR "Birth weight" OR "Hypertensive disorders" OR "Pregnancy-Induced Hypertension" OR "Gestational diabetes" OR "Preterm birth" OR "Premature birth" OR "fetal growth" OR "Pregnancy complications" OR "birth size OR "Small-for-gestational age"
ProQuest	ab(Pregnancy OR Pregnancies OR Gestation OR Pregnan* OR "Pregnant women" OR "Pregnant woman" OR "Woman, pregnant" OR "Women, pregnant" OR Maternal OR Antenatal OR "Maternal exposure") AND ab("Ultraprocessed food" OR "Ultraprocessed foods" OR "Ultra-processed food" OR "Ultra-processed foods" OR "Industrialized food" OR "Processed food" OR "Ready-to-eat meal" OR "ready-to-eat food" OR "Ready-Prepared Food" OR "fast food" OR "non-home-prepared food" OR "Sodium intake" OR "salt intake" OR "salt food" OR "Salty food" OR "High-fat food" OR "high-fat diet" OR "high-sucrose" OR "high-salt" OR "High sodium food" OR "soft drink" OR "highly processed foods" OR "refined food" OR "high sugar" OR "junk food" OR "sugar-sweetened beverage" OR "sugar-sweetened beverages" OR "unhealthy eating" OR "unhealthy diet" OR

	"unhealthy nutrition" OR "Unhealthy dietary habits" OR "Unhealthy dietary patterns" OR "unhealthy dietary behaviors" OR "unhealthy food" OR "diet quality" OR "dietary energy density" OR "High energy density" OR "poor diet" OR "dietary quality" OR "processed meat" OR "western diet" OR Snacks OR "processing pattern" OR "added sugar" OR "refined grain") AND ab("Perinatal outcome" OR "perinatal outcomes" OR "gestational weight gain" OR "pregnancy weight gain" OR "birth outcomes" OR "birth outcome" OR "Birth weight" OR "Hypertensive disorders" OR "Pregnancy-Induced Hypertension" OR "Gestational diabetes" OR "Blood pressure" OR hypertension OR "Gestational Hypertension" OR "Preterm birth" OR "Preterm delivery" OR "Premature birth" OR prematurity OR "fetal growth" OR "Pregnancy complications" OR "Pregnancy outcomes" OR "pregnancy outcome" OR "outcome of pregnancy" OR "glycemic outcomes" OR "birth size" OR Birthweight OR "Neonatal weight" OR "Newborn weight" OR "Small-for-gestational age")

Apêndice 3 – Avaliação individual do risco de viés

Table 1. Risk of bias for each individual study assessed by Joanna Briggs Institute critical appraisal checklist for cohort studies.

Studies	Criteria										
	1*	**2***	**3***	**4***	**5***	**6***	**7***	**8***	**9***	**10***	**11***
Alves-Santos et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ancira-Moreno et al., 2020	Y	Y	Y	Y	Y	Y	U	Y	Y	U	Y
Angali, Shahri & Borazjani, 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
Barbosa et al., 2021	Y	Y	Y	Y	Y	U	N	Y	Y	N	Y
Bärebring et al., 2016	NA	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Baskin et al., 2015	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	N
Borgen et al., 2012	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Brantsæter et al., 2009	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	Y
Chen et al., 2009	Y	Y	Y	Y	Y	N	Y	Y	Y	U	Y
Coelho et al, 2015	N	Y	N	Y	Y	Y	N	U	U	U	Y
Dale et al, 2019	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Dominguez et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Donazar-Ezcurra et al., 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Donazar-Ezcurra et al., 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Englund-Ögge et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	U	U	Y
Englund-Ögge et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	U	Y
Gomes et al, 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Grundt et al., 2016	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Günther et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hajianfar et al., 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hajianfar et al., 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Hirko et al, 2020	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	Y
Ikem et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Itani et al., 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ker et al., 2021	N	Y	N	Y	Y	N	Y	Y	Y	NA	Y
Lamyian et al., 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Marí-Sanchiz et al., 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Martin et al., 2016	Y	Y	Y	Y	Y	Y	N	Y	N	N	Y
Martin et al., 2016	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Maugeri et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mikeš et al., 2021	Y	Y	Y	Y	Y	Y	Y	N	Y	U	Y
Mitku et al., 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nascimento et al., 2016	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Nicolì et al., 2021	U	Y	Y	Y	Y	U	Y	N	U	U	Y
Okubo et al, 2012	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rasmussen et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Rohatgi et al., 2017	NA	NA	Y	Y	Y	Y	Y	Y	Y	U	Y
Schimidt et al., 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tamada et al., 2021	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
Teixeira et al., 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Tielemans et al., 2015	Y	Y	Y	Y	Y	U	Y	Y	Y	Y	Y
Uusitalo et al., 2009	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
Wen et al., 2013	Y	Y	Y	Y	Y	Y	N	Y	Y	U	Y
Wrottesley, Pisa & Norris, 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Yong et al.., 2021	Y	Y	Y	Y	Y	Y	Y	Y	Y	NA	Y
Zhang et al., 2006	Y	Y	Y	Y	Y	Y	Y	U	Y	Y	Y
Zhu et al., 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y = Yes, N = No, U = Unclear, NA = Not applicable

1* The two groups were similar and recruited from the same population.

2* The exposures were measured similarly to assign people to both exposed and unexposed groups.

3* The exposure was measured in a valid and reliable way.

4* The confounding factors were identified.
5* Strategies to deal with confounding factors were stated.
6* The groups/participants were free of the outcome at the start of the study (or at the moment of exposure).
7* The outcomes were measured in a valid and reliable way.
8* The follow up time was reported and sufficient to be long enough for outcomes to occur.
9* The follow up was complete, and if not, the reasons to loss to follow up were described and explored.
10* Strategies to address incomplete follow up were utilized.
11* Appropriate statistical analysis.

Table 2. Risk of bias for each individual study assessed by Joanna Briggs Institute critical appraisal checklist for cross-sectional studies.

Studies	Criteria							
	1*	**2***	**3***	**4***	**5***	**6***	**7***	**8***
Garay et al, 2019	Y	Y	Y	Y	Y	Y	Y	Y
Grieger, et al., 2014	Y	Y	Y	Y	Y	Y	Y	Y
Loy, Marhazlina & Jan, 2013	Y	Y	Y	Y	Y	Y	Y	Y
Liu et al., 2021	N	Y	Y	Y	Y	Y	N	Y
Marquez, 2012	Y	Y	Y	Y	Y	Y	Y	Y
Rodrigues, Azeredo & Silva, 2020	Y	Y	Y	Y	Y	Y	Y	Y
Zareei et al, 2019	Y	Y	Y	Y	Y	Y	Y	Y
Zuccolotto et al, 2019	Y	Y	Y	Y	Y	Y	Y	Y

Y = Yes, N = No, U = Unclear, NA = Not applicable
1* Criteria for inclusion in the sample clearly defined.
2* Study subjects and the setting described in detail.
3* Exposure measured in a valid and reliable way.
4* Objective, standard criteria used for measurement of the condition.
5* Confounding factors identified.
6* Strategies to deal with confounding factors stated.
7* Outcomes measured in a valid way.
8* Appropriate statistical analysis.

Table 3. Risk of bias for each individual study assessed by Joanna Briggs Institute critical appraisal checklist for case-control studies.

Studies	Criteria									
	1*	**2***	**3***	**4***	**5***	**6***	**7***	**8***	**9***	**10***
Abbasi et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Amezcua-Prieto et al, 2019	Y	Y	Y	Y	Y	Y	Y	Y	U	Y
Asadi et al., 2019	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Chen et al., 2020	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sedaghat et al, 2017	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y = Yes, N = No, U = Unclear, NA = Not applicable
1* Groups comparable other than the presence of disease in cases or the absence of disease in controls.
2* Cases and controls matched appropriately.
3* Same criteria used for identification of cases and controls.
4* Exposure measured in a standard, valid and reliable way.
5* Exposure measured in the same way for cases and controls.
6* Confounding factors identified
7* Strategies to deal with confounding factors stated.
8* Outcomes assessed in a standard, valid and reliable way for cases and controls.
9* Exposure period of interest long enough to be meaningful.
10* Appropriate statistical analysis.

Apêndice 4 – Termo de Consentimento Livre e Esclarecido

GOVERNO DO DISTRITO FEDERAL
SECRETARIA DE ESTADO DE SAÚDE
Fundação de Ensino e Pesquisa em Ciências da Saúde

COMITÊ DE ÉTICA EM PESQUISA

Termo de Consentimento Livre e Esclarecido - TCLE

O (a) Senhor (a) está sendo convidado (a) a participar do projeto *ESTADO NUTRICIONAL DE IODO, SÓDIO E POTÁSSIO ENTRE GESTANTES, NUTRIZES E LACTENTES BRASILEIROS: UM ESTUDO MULTICÊNTRICO – etapa Brasilia***,** sob a responsabilidade do pesquisador *Profª Drª Nathalia Pizato.*

O nosso objetivo é *avaliar os fatores associados ao estado nutricional de iodo, sódio e potássio em gestantes, nutrizes e lactentes em diferentes regiões brasileiras***.**

O (a) senhor (a) receberá todos os esclarecimentos necessários antes e no decorrer da pesquisa e lhe asseguramos que seu nome não será divulgado, sendo mantido o mais rigoroso sigilo através da omissão total de quaisquer informações que permitam identificá-lo(a)

A sua participação será através de um questionário que você deverá responder no setor de *Unidades Básicas de Saúde no DF. A sua participação se dará por meio de uma* ***consulta, com entrevista sobre dados sociodemográficos e nutricionais se gestante ou nutriz.*** *Uma segunda consulta será realizada na casa da participante da pesquisa para a coleta de urina e/ou leite materno, e coleta do sal utilizado para tempero no domicílio. Esta segunda consulta será agendada de acordo com a disponibilidade da participante da pesquisa. A coleta de dados será realizada entre os meses de agosto de 2019 a julho de 2020* em *durante a consulta* com um tempo estimado *para realização de consultas de 3****0 minutos*** *cada* para sua realização.

Os riscos decorrentes de sua participação na pesquisa são:

1. Risco de constrangimento para responder as perguntas do questionário na etapa de coleta dos dados socioeconômicos e de saúde. Para minimizar este risco uma equipe de profissionais treinada fará as entrevistas em local tranquilo, de modo a deixar a minimizar quaisquer desconfortos durante a entrevista. As participantes da pesquisa podem se negar a responder qualquer item do questionário, sem prejuízo para as mesmas. Os questionários serão identificados por números, impossibilitando assim a identificação do entrevistado, a não ser pela equipe de pesquisa.

2. Risco de constrangimento na coleta do leite materno. Para minimizar este risco a coleta do leite será realizada em ambiente residencial privado pela própria nutriz sob a supervisão de um profissional habilitado, quando necessário.

3. Risco de constrangimento ou ferimentos durante a coleta de urina do bebê. Para minimizar este risco a coleta das amostras de urina dos bebês será realizada pela própria mãe em sua residência após orientação fornecida por um pesquisador da equipe. As mães serão orientadas a coletar as amostras de urina de seus filhos somente se estes estiverem em condições ideais de saúde e bem-estar para realização de tal procedimento. Caso haja necessidade, a coleta das amostras será realizada em data previamente agendada por um membro da equipe devidamente capacitado.

4. Risco de reconhecimento dos participantes da pesquisa por terceiros. Para minimizar este risco os questionários bem como os recipientes com as amostras coletadas serão identificadas por códigos numéricos restringindo qualquer possibilidade de reconhecimento dos participantes por parte de indivíduos alheios à pesquisa. Se você aceitar participar, estará contribuindo para *a avaliação nutricional e informações sobre saúde e alimentação da senhora e seu bebê, além da contribuição para a elaboração de llrecomendações específicas para esse grupo de pacientes no Brasil, fortalecendo a política nacional de saúde de gestantes e crianças. .*

O (a) Senhor (a) pode se recusar a responder, ou participar de qualquer procedimento e de qualquer questão que lhe traga constrangimento, podendo desistir de participar da pesquisa em qualquer momento sem nenhum prejuízo para o (a) senhor (a).

Rubrica

Não há despesas pessoais para o participante em qualquer fase do estudo, incluindo *coleta e análise de amostras de sal, urina e leite materno***.** Também não há compensação financeira relacionada à sua participação, que será participante da pesquisa. Se existir qualquer despesa
adicional relacionada diretamente à pesquisa (tais como, passagem para o local da pesquisa, alimentação no local da pesquisa ou exames para realização da pesquisa) a mesma será absorvida pelo orçamento da pesquisa.

Os resultados da pesquisa serão divulgados aqui no setor *Faculdade de Ciências da Saúde UnB – FS* podendo ser publicados posteriormente. Os dados e materiais utilizados na pesquisa ficarão sobre a guarda do pesquisador.

Se o (a) Senhor (a) tiver qualquer dúvida em relação à pesquisa, por favor, telefone para: *Profª Drª Nathalia Pizato*, na *Faculdade de Ciências da Saúde UnB – FS* no telefone *(61) 99227-7179*, no horário *08h às 11h e das 14h às 17h*, disponível inclusive para ligação a cobrar. *nathaliapizato@gmail.com***.**

Este projeto foi aprovado pelo Comitê de Ética em Pesquisa da FEPECS-SES/DF. O CEP é composto por profissionais de diferentes áreas cuja função é defender os interesses dos participantes da pesquisa em sua integridade e dignidade e contribuir no desenvolvimento da pesquisa dentro de padrões éticos. As dúvidas com relação à assinatura do TCLE ou os direitos do sujeito da pesquisa podem ser obtidos através do telefone: (61) 2017 - 2132 R 6878 ou e- mail: comitedeetica.secretaria@gmail.com.

Caso concorde em participar, pedimos que assine este documento que foi elaborado em duas vias, uma ficará com o pesquisador responsável e a outra com o Senhor (a).

_____
Nome / assinatura

_____
Pesquisador Responsável
Nome e assinatura

Brasília,___de_____de2021.

Apêndice 5 – Formulário de coleta de dados

GESTANTES

BLOCO I: ELEGIBILIDADE

1. **Você vai coletar dados em qual município?**_____
2. **Selecione a Unidade Básica de Saúde, no município, que você irá coletar os dados:**

   _____

3. **Nome:**_____
4. **Data de nascimento:** _ _/_ _/_ _ _ _
5. **Data da entrevista:** _ _/_ _/_ _ _ _
6. **Idade (anos):** _____

1

7. **A senhora apresenta alguma doença tireoidiana diagnosticada (hipotireoidismo, hipertireoidismo, tireoidite de Hashimoto, neoplasias)?**

☐ Sim *(encerre a entrevista)*
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

8. **A senhora já teve alguma doença tireoidiana diagnosticada?**

☐ Sim *(encerre a entrevista)*
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

9. **A senhora já realizou alguma cirurgia tireoidiana?**

☐ Sim *(encerre a entrevista)*
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

10. **Trimestre de gestação:**

☐ Primeiro (até 13 semanas de gestação)
☐ Segundo (14 a 27 semanas de gestação)
☐ Terceiro (28 ou mais semanas de gestação)

(Se 7 ou 8 ou 9 diferente de "não" encerre a entrevista, caso contrário passe ao Bloco II)

BLOCO II: PACIENTE

I ANTECEDENTES OBSTÉTRICOS

1. Sua gravidez atual foi planejada?

☐ Sim
☐ Não

Sobre as gestações anteriores (Por favor, solicite o cartão de informação da gestante. Priorize SEMPRE a informação do cartão).

2. Você esteve grávida antes deste bebê?

☐ Sim
☐ Não (***Se não, PULAR AS QUESTÕES DE 3 a 13 b***)

3. Que idade você tinha quando engravidou pela PRIMEIRA vez? _____anos.

4. Antes dessa gravidez, quantas vezes você esteve grávida (excluindo gestação atual/recente)?_____

5.Antes dessa gravidez, as gestações evoluíram para parto?

☐ Sim quantas? ___
☐ Não

6. Antes dessa gravidez, as gestações evoluíram para aborto?

☐ Sim quantos? ___
☐ Não

a.Antes dessa gravidez, a senhora já teve algum aborto espontâneo?

☐ Sim quantos? ___
☐ Não

b.Antes dessa gravidez, a senhora já teve algum aborto provocado?

☐ Sim quantos? ___
☐ Não

c. Nos últimos 2 anos a senhora teve algum aborto?

☐ Sim quantas? ___
☐ Não
data do aborto: __/__/___

7.Antes dessa gravidez, quais foram os tipos de parto?

Partos normais____ partos com fórceps____ Cesarianas____ (***anotar quantos nascimentos em cada tipo***)

8. Algum filho nasceu antes do tempo, ou seja, prematuro (antes de completar 37 semanas)?

☐ Sim quantos? ___
☐ Não

9. Algum filho nasceu com baixo peso, ou seja, com menos de 2.500g?

☐ Sim quantos? ___
☐ Não

10. Qual a idade dos seus filhos (***anotar em anos e meses para cada filho, começando do mais novo para o mais velho***)?
__anos__ meses
__anos__ meses
__anos__ meses
__anos__ meses
__anos__ meses

11.Todos os filhos vivem?

☐ Sim (***pular o restante das questões sobre história obstétrica***)
☐ Não

12. Algum filho nasceu morto?

☐ Sim quantos? ___
☐ Não

13. Algum filho morreu após o parto?

☐ Sim quantos? ___
☐ Não

a. Algum filho morreu na primeira semana de vida?

☐ Sim quantos? ___
☐ Não

b. Algum filho morreu no primeiro mês de vida?

☐ Sim quantos? ___
☐ Não

SOBRE A GESTAÇÃO ATUAL

14. A senhora possui o cartão da gestante?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

15. A senhora sabe em que semana da gestação foi feita a primeira consulta?
☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

16. Em que semana da gestação foi feita a primeira consulta? __ __semanas

17. A senhora sabe quantas consultas foram feitas durante a gestação até o presente momento?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

18. Quantas consultas foram feitas durante a gestação até o presente momento?__ __ consultas

19. A senhora tem hipertensão arterial diagnosticada (anterior à gestação)?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

20. A senhora teve ou tem hipertensão arterial durante a gestação?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

4

21. Quando foi feito o diagnóstico? _ _ semana(s) de gestação

22. A senhora faz uso de algum suplemento nutricional para gestantes?

☐ Ácido fólico
☐ Sulfato ferroso
☐ Femme (150 µg)
☐ Iodacif 60 (100µg)
☐ Iodara (100µ g)
☐ Iodara (200 µg)
☐ Materna (150 µg)
☐ Ogestan Plus (130 µg)
☐ Regenesis (200 µg)
☐ Outros *(Preencha a questão 23)*
☐ Não *(PASSE AO 26)*

23. Quais?

24. O suplemento contém iodo?
1☐ Sim
2☐ Não *(PASSE AO 26)*
8☐ Não quer responder
9☐ Não sabe/não lembra

25. Qual a quantidade em (µg): _ _ _ _**µg***(registrar 9999 se não sabe ou não lembra)*

26. A senhora faz uso de algum medicamento atualmente?
1☐ Sim
2☐ Não *(passe ao 17 PASSE AO 26???)*
8☐ Não quer responder
9☐ Não sabe/não lembra

27. Quais? (até 50)

_____
_____
_____

28. A senhora fez cirurgia bariátrica?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

29. Em que ano? _ _ _ _

Para responder as questões 30 à 42, priorize à informação do cartão da gestante

30. Peso pré-gestacional (Referido ou aferido até a 14ª semana de gestação): _ _ _ Kg

31. Peso atual: _ _ _Kg

32. Altura materna: _ _ _cm

33. Hemoglobina:_ _ _*(ler no cartão o resultado do último exame)*

34. Hematócrito: _ _ _

35. Glicemia média estimada: _ _ _

5

36. Acido Úrico: _,_

37. Pressão arterial: _ _ /_ _

38. Presença de Edema?

☐ Sim
☐ Não

39. Batimentos cardiofetais: _ _ _ ☐ Não se aplica

40. Movimentos fetais:

☐ Positivos
☐ Negativos

41. Data da Última Menstruação: _ _/_ _/_ _ _ _ ☐ Não sabe/não lembra (Ir para questão 43)

42. Idade Gestacional (semanas): _ _

43. A senhora sabe o mês da sua última menstruação?

☐ Sim *(Se sim, responda as questões 44, 45 e 46)*
☐ Não *(Se não, responda as questões 47 e 48)*

44. Qual o mês da sua última menstruação? _____

45. Sabendo o mês da sua última menstruação, qual foi a época?

☐ Início do mês (1º ao 10º dia do mês) – insira dia 05 na data abaixo
☐ Meio do mês (11º ao 20º dia do mês) – insira dia 15 na data abaixo
☐ Final do mês (21º ao 31º dia do mês) – insira dia 25 na data abaixo

46. Insira, com base nas informações das questões 44 e 45, os dados sobre dia, mês e ano referente à provável data da última menstruação: _ _/_ _/_ _ _ _

47. Insira a data do último ultrassom realizado pela gestante: _ _/_ _/_ _ _ _

48. Insira a idade gestacional (em semanas e dias) indicada no último ultrassom realizado:

_____**semanas e** _____**dias**

49. Data Provável do Parto: _ _/_ _/_ _ _ _ ☐ Não sabe/não lembra

BLOCO III: SAL DE COZINHA

1.Quais refeições a senhora consome alimentos preparados em casa com mais frequência? (assinale todas as alternativas correspondentes)

- ☐ Desjejum
- ☐ Lanche da manhã
- ☐ Almoço
- ☐ Lanche da tarde
- ☐ Jantar
- ☐ Lanche da noite/ceia
- ☐ Nenhuma refeição consumida é preparada no domicílio

2.Durante a semana, incluindo os finais de semana, com que frequência a senhora consome alimentos preparados em seu domicílio? (Selecione apenas uma alternativa, a que corresponder ao valor mais relevante)

- ☐ 1 dia
- ☐ 2 dias
- ☐ 3 dias
- ☐ 4 dias
- ☐ 5 dias
- ☐ 6 dias
- ☐ 7 dias
- ☐ Nenhum dia

3.Durante a semana, incluindo os finais de semana, quais as refeições a senhora costuma consumir alimentos preparados fora do seu domicílio (restaurante, pensão, ...)? (assinale todas as alternativas correspondentes)

- ☐ Desjejum
- ☐ Lanche da manhã
- ☐ Almoço
- ☐ Lanche da tarde
- ☐ Jantar
- ☐ Lanche da noite/ceia
- ☐ Nenhuma refeição consumida é preparada fora do domicílio

4. Durante a semana, incluindo os finais de semana, com que frequência a senhora consome alimentos preparados fora do seu domicílio? (Selecione apenas uma alternativa, a que corresponder ao valor mais relevante)

- ☐ 1 dia
- ☐ 2 dias
- ☐ 3 dias
- ☐ 4 dias
- ☐ 5 dias
- ☐ 6 dias
- ☐ 7 dias
- ☐ Nenhum dia

5. Que tipo de sal a senhora usa com maior frequência?

- ☐ Nenhum (não consome sal)
- ☐ Sal para animal
- ☐ Sal marinho
- ☐ Sal grosso
- ☐ Sal refinado
- ☐ Sal rosa
- ☐ Sal light
- ☐ Sal negro
- ☐ Flor de sal
- ☐ Sal maldon
- ☐ Sal do Himalaia
- ☐ Outro Qual? _____

6. Qual marca de sal a senhora utiliza? _____

7. Onde habitualmente a senhora guarda esse sal?

- ☐ Em local fresco e ventilado
- ☐ Em local úmido
- ☐ Dentro da geladeira
- ☐ Próximo a fontes de calor
- ☐ Não foi possível observa (para entrevistas não realizadas no domicílio).
- ☐ Outro. Especifique: _____

8. Como habitualmente a senhora guarda o sal de cozinha?

- ☐ Retira o sal da embalagem original e o transfere para outro recipiente aberto ou semi aberto
- ☐ Retira o sal da embalagem original e o transfere para outro recipiente fechado
- ☐ Mantém o sal dentro da embalagem original aberta
- ☐ Mantém o sal dentro da embalagem original, e guarda em um recipiente fechado
- ☐ Outro. Especifique: _____

9. A senhora utiliza o sal em sua forma pura (sal puro e não sob a forma de tempero caseiro ou industrializado) no preparo e/ou cozimento dos alimentos em sua casa?

- ☐ Sim
- ☐ Não *(passe ao 13)*

10. Com que frequência?

- ☐ Diariamente
- ☐ Semanalmente
- ☐ Quinzenalmente
- ☐ Mensalmente
- ☐ Raramente

11. A senhora tem o hábito de adicionar sal ao prato de comida durante as refeições?

- ☐ Sim
- ☐ Não *(passe ao 12)*

12. Com que frequência a senhora adicional sal ao prato de comida durante as refeições?

- ☐ Diariamente
- ☐ 1 a 3 vezes por semana
- ☐ 4 a 6 vezes por semana
- ☐ Raramente

13. Ontem a senhora estava em uma dieta hipossódica (com pouco sal)?

- ☐ Sim
- ☐ Não
- ☐ Não quer responder
- ☐ Não sabe/não lembra

14. Ontem a senhora adicionou sal ao prato de comida durante as refeições?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

15. **Quanto tempo dura 1 kg de sal em sua casa?**_ _ meses ☐ Não sabe/não lembra

16. A senhora utiliza tempero caseiro no preparo e/ou cozimento dos alimentos em sua casa?

☐ Sim
☐ Não *(passe ao 24)*

(Tempero caseiro: composto preparado artesanalmente no próprio domicílio por meio da adição de gêneros frescos como cebola, alho e ervas ao sal de cozinha.)

17. Com que frequência?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

18. Ontem a senhora usou tempero caseiro com sal em alguma preparação?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

19. Qual o sal que habitualmente a senhora utiliza para fazer o tempero caseiro?

☐ Não sabe, outra pessoa faz o tempero
☐ Sal para animal
☐ Sal marinho
☐ Sal grosso
☐ Sal refinado iodado
☐ Sal rosa
☐ Sal light
☐ Sal negro
☐ Flor de sal
☐ Sal maldon
☐ Sal do Himalaia
☐ Outro. Especifique: _____

20. Onde habitualmente a senhora guarda o tempero caseiro?

☐ Em local fresco e ventilado
☐ Em local úmido
☐ Dentro da geladeira
☐ Próximo a fontes de calor
☐ Não foi possível observa (para entrevistas não realizadas no domicílio).
☐ Outro. Especifique: _____

21. Qual a quantidade de tempero caseiro a senhora prepara/compra (em gramas)?_ _ _ _ g

☐ Não sabe/não lembra

22. Quanto de sal a senhora usa no preparo do tempero caseiro?_ _ _ _ gramas
(Caso a resposta seja em medida caseira, padronizar em colheres de sopa e fazer a conversão: 1 colher de sopa = 20 gramas de sal)

23. Quanto tempo dura o tempero caseiro?_ _ _ _ meses

24. A senhora utiliza tempero industrializado no preparo e cozimento dos alimentos?
(Tempero industrializado: Tempero pronto para uso, preparado industrialmente e adquirido em estabelecimentos comerciais.)

☐ Sim
☐ Não *(passe ao blocoIV)*

25. **Qual marca de tempero industrializado a senhora usa com mais frequência?**

_____

26. Com que frequência?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

27. Onde habitualmente a senhora guarda o tempero industrializado?

☐ Em local fresco e ventilado
☐ Em local úmido
☐ Dentro da geladeira
☐ Próximo a fontes de calor
☐ Não foi possível observa (para entrevistas não realizadas no domicílio).
☐ Outro. Especifique: _____

28. Qual a quantidade de tempero industrializado a senhora compra (em gramas)?_ _ _ _ g

☐ Não sabe/não lembra

29. Quanto tempo dura essa quantidade de tempero industrializado?_ _ _ meses

☐ Não sabe/não lembra

30. Em relação ao seu consumo de açúcar, qual das opções abaixo é mais frequente?
☐ Açúcar refinado
☐ Açúcar cristal
☐ Açúcar Demerara
☐ Açúcar mascavo/integral
☐ Adoçante
☐ Não consome

31. Quando a senhora consome açúcar, habitualmente, qual quantidade consome?

☐ Muito pouco
☐ Pouco
☐ Quantidade mediana

☐ Bastante
☐ Não sabe/não lembra
☐ Não se aplica

BLOCO IV: FUMO E ÁLCOOL

Quanto ao fumo – uso atual, neste/momento da sua vida

1. A senhora fuma?

☐ Sim
☐ Não
☐ Não quer responder
☐ Não sabe/não lembra

2. Com que frequência a senhora fuma?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

3a. Quantos cigarros a senhora fuma diariamente?

_ _ cigarros

3b. Quantos cigarros a senhora fuma semanalmente?

_ _ cigarros

3c. Quantos cigarros a senhora fuma quinzenalmente?

_ _ cigarros

3d. Quantos cigarros a senhora fuma mensalmente?

_ _ cigarros

13. Alguém na sua residência fuma dentro de casa (exceto a própria respondente)?

☐ Sim
☐ Não

Quanto ao fumo durante toda a gestação atual

4. A senhora fumou durante o 1º trimestre de gestação?
☐ Sim
☐ Não *(se gestante no primeiro semestre passe ao 13) (se gestante no segundo ou terceiro semestre passe ao 7)*

5. Com que frequência a senhora fumou durante o 1º trimestre?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

6a. Quantos cigarros a senhora fumou diariamente no 1º trimestre?
_ _ cigarros

6b. Quantos cigarros a senhora fumou semanalmente no 1º trimestre?
_ _ cigarros

6c. Quantos cigarros a senhora fumou quinzenalmente no 1º trimestre?
_ _ cigarros

6d. Quantos cigarros a senhora fumou mensalmente no 1º trimestre?
_ _ cigarros*(se gestante no primeiro semestre passe ao 13)*

7. A senhora fumou durante o 2º trimestre de gestação?
1☐ Sim
2☐ Não *(se gestante no segundo semestre passe ao 13)(se gestante no terceiro semestre passe ao 10)*

8. Com que frequência a senhora fumou durante o 2º trimestre?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

9a. Quantos cigarros a senhora fumou diariamente no 2º trimestre?
_ _ cigarros

9b. Quantos cigarros a senhora fumou semanalmente no 2º trimestre?
_ _ cigarros

9c. Quantos cigarros a senhora fumou quinzenalmente no 2º trimestre?
_ _ cigarros

9. Quantos cigarros a senhora fumou mensalmente no 2º trimestre?
_ _ cigarros

10. A senhora fumou durante o 3º trimestre de gestação?
1☐ Sim
2☐ Não

11. Com que frequência a senhora fumou?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

12a. Quantos cigarros a senhora fumou diariamente no 3º trimestre?
_ _ cigarros

12b. Quantos cigarros a senhora fumou semanalmente no 3º trimestre?
_ _ cigarros

12c. Quantos cigarros a senhora fumou semanalmente no 3º trimestre?
_ _ cigarros

12d. Quantos cigarros a senhora fumou mensalmente no 3º trimestre?
_ _ cigarros

Quanto ao uso de álcool neste momento da gestação

13. A senhora bebe atualmente?

☐ Sim
☐ Não
☐ Não quer responder

14.Qual bebida a senhora consome com mais frequência? (assinale apenas uma alternativa, referente a mais frequente)

☐ Cerveja
☐ Vinho / espumante
☐ Bebida destilada (cachaça, licor, gin, rum, vodca, whisky, ...)
☐ Drink / coquetel (caipirinha, Martini, ...)
☐ Outro

15. Com que frequência a senhora bebe?

☐ Diariamente
☐ Semanalmente
☐ Quinzenalmente
☐ Mensalmente
☐ Raramente

BLOCO V: SOCIOECONÔMICO

1. Qual o seu local de residência?

☐ Urbano
☐ Rural

2. Tipo do logradouro: _____

3. Nome do logradouro:
_____

4. Número do logradouro:_____

5. Complemento:
_____

6. Bairro:
_____

7. Telefone:
_____

8. CEP:
_____

9. **Quantos cômodos servindo de dormitório têm em seu domicílio?** _ _ cômodos

10. Quantas pessoas residem em seu domicílio?_ _ pessoas

11. A senhora vive com companheiro(a) ou cônjuge?

☐ Sim
☐ Não, mas já viveu
☐ Não

12. Até que série a senhora estudou com aprovação?

☐ Sem instrução
☐ Primeira série do Ensino fundamental
☐ Segunda série do Ensino fundamental
☐ Terceira série do Ensino fundamental
☐ Quarta série do Ensino fundamental
☐ Quinta série do Ensino fundamental
☐ Sexta série do Ensino fundamental
☐ Sétima série do Ensino fundamental
☐ Oitava série do Ensino fundamental
☐ Nona série do Ensino fundamental
☐ Primeira série do Ensino médio
☐ Segunda série do Ensino médio
☐ Terceira série do Ensino médio
☐ Ensino superior incompleto
☐ Ensino superior completo
☐ Pós-graduação

13. Qual a sua cor ou raça (autodeclarado)?

☐ Branca
☐ Preta
☐ Amarela (Origem japonesa, chinesa, coreana etc.)
☐ Parda (Mulata, cabocla, cafuza, mameluca ou mestiça de preto com pessoa de outra cor ou raça.)
☐ Indígena

14. A senhora recebe algum benefício de políticas públicas?

☐ Bolsa Família
☐ Aposentadoria
☐ Pensão
☐ Benefício de Prestação Continuada (pessoa com deficiência ou idoso com 65 anos ou mais)
☐ Fundo Cristão
☐ Outro. Especifique: _____
☐ Não
☐ Não quer responder

15a. Valor do Bolsa Família: R$ _ _ _ _,_ _ ☐ **Não sabe/ não lembra** ☐ **Não quer responder**

15b. Valor da Aposentadoria: R$ _ _ _ _,_ _ ☐ **Não sabe/ não lembra** ☐ **Não quer responder**

15c. Valor da Pensão: R$ _ _ _ _,_ _ ☐ **Não sabe/ não lembra** ☐ **Não quer responder**

15d. Valor do Benefício de Prestação Continuada: R$ _ _ _ _,_ _

☐ **Não sabe/ não lembra** ☐ **Não quer responder**

15e. Valor do Fundo Cristão: R$ _ _ _ _,_ _ ☐ **Não sabe/ não lembra** ☐ **Não quer responder**

15f. Valor do Outro Benefício: R$ _ _ _ _,_ _ ☐ **Não sabe/ não lembra** ☐ **Não quer responder**

16. No mês passado, qual foi sua renda domiciliar?

R$_ _ _ _ _,_ _ ☐ **Não sabe/ não lembra** ☐ **Não quer responder**

17. No mês passado, qual foi sua renda domiciliar?

☐ Sem rendimento
☐ Até R$ 499,00
☐ Entre R$ 500,00 a R$ 999,00
☐ Entre R$ 1000,00 a R$ 1999,00
☐ Entre R$ 2000,00 a R$ 2999,00
☐ Entre R$ 3000,00 a R$ 3999,00
☐ Entre R$ 4000,00 a R$ 4999,00
☐ R$ 5000,00 ou mais
☐ Não sabe/ não lembra
☐ Não quer responder

18. No mês passado, a senhora tinha trabalho remunerado?

☐ Sim
☐ Não

19. No trabalho principal, a senhora era:

☐ Empregada no setor privado com carteira (exclusive trabalhadora doméstica)
☐ Empregada no setor privado sem carteira (exclusive trabalhadora doméstica)
☐ Trabalhadora doméstica com carteira assinada
☐ Trabalhadora doméstica sem carteira assinada
☐ Empregada no setor público (inclusive servidora estatutária e militar)
☐ Empregadora
☐ Conta própria FORMAL (trabalhadora autônoma, com CNPJ ou recolhimento do INSS)
☐ Conta própria INFORMAL (trabalhadora autônoma, sem CNPJ ou recolhimento do INSS)

20. A senhora era contribuinte de instituto de previdência no trabalho principal?

☐ Sim
☐ Não

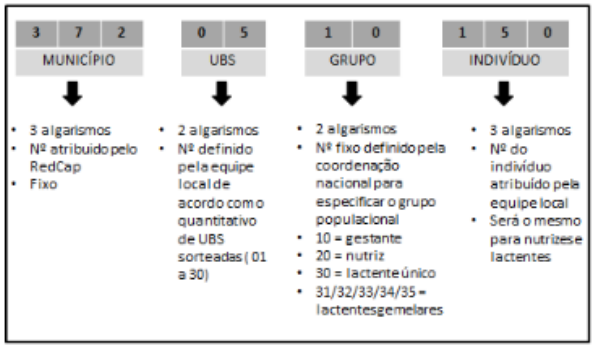
21. Quem a senhora considera ser o chefe do domicílio?

☐ Ela mesma
☐ Mãe
☐ Pai
☐ Sogro/Sogra
☐ Filhos
☐ Companheiro (a)
☐ Outro morador

14

BLOCO VI: COLETA DE MATERIAL

Registre abaixo as informações de identificação das amostras que serão enviadas para análise conforme o exemplo ilustrado:



1. Insira o código identificador da gestante de 10 dígitos conforme o modelo a cima:

_ _ _ _ _ _ _ _ _ _

2. Insira as iniciais da paciente: _____

3. Você realizou a coleta de urina da gestante?

☐ Sim. Data: _ _/_ _/_ _ _ _
☐ Não. Motivo:_____

Data de agendamento da coleta: _ _/_ _/_ _ _ _

BLOCO VII: SEGUNDA COLETA

Registre abaixo as informações de identificação das amostras que serão enviadas para análise conforme o exemplo ilustrado e seguido do algarismo II:

15

Apêndice 6 – Recordatório 24-horas

Recordatório 24-horas

C = caseiro I = industrializado NS = não sabe NA = Não se aplica

DATA: ___I____I_____ **ID:**_____ **DIA DA SEMANA:**_____ **DIA ESPECIAL? ( ) NÃO ( ) SIM, QUAL:** _____

HORA	NOME ALIMENTO /RECEITA	REFEIÇÃO						LOCAL DE CONSUMO					PROCESSAMENTO				MARCA			TIPO/SABOR			MODO DE PREPARO			QUANTIFICAÇÃO	
		Café da manhã	Lanche Manhã	Almoço	Lanche tarde	Jantar	Após Jantar	Casa	Casa amigos/parente	Na rua	Restaurante	Outro, especificar	C	I	NS	NA	Nome	NS	NA	Nome	NS	NA	Nome	NS	NA	Quantidade	Código Foto, Unidade padrão, g/ml, medida caseira

Recordatório 24-horas

C = caseiro I = industrializado NS = não sabe NA = Não se aplica

HORA	NOME ALIMENTO /RECEITA	REFEIÇÃO						LOCAL DE CONSUMO					PROCESSAMENTO				MARCA			TIPO/SABOR			MODO DE PREPARO			QUANTIFICAÇÃO	
		Café da manhã	Lanche Manhã	Almoço	Lanche tarde	Jantar	Após Jantar	Casa	Casa amigos/parente	Na rua	Restaurante	Outro, especificar	C	I	NS	NA	Nome	NS	NA	Nome	NS	NA	Nome	NS	NA	Quantidade	Código Foto, Unidade padrão, g/ml, medida caseira

DETALHAMENTO SOBRE USO DE SAL, GORDURA (tipo) E OUTRAS ADIÇÕES NAS PREPARAÇÕES (ex. arroz, feijão, saladas, carnes e demais receitas)

DETALHAMENTO DE RECEITAS Caso o(a) entrevistado(a) CONHEÇA alguma informação sobre a receita listada acima, favor informar abaixo. Exemplo: ingredientes e/ou quantidades

NOTAS DO ENTREVISTADOR SOBRE O R24H