King's College

Master's of Nutrition & Dietetics

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In adults, aged 19-45 years, with self-reported digestive problems, what is the effect of consuming unprocessed foods (fresh organic vegetables and meat, and whole fruits etc.) on gut problems (diarrhea, constipation, gut inflammation etc.) compared with consuming highly processed foods (vegetable oils, white bread and pasta etc.) over a time period of 3 months?

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INTRODUCTION

Hilda Glickman is a Nutritionist who has written several books with the aim of conveying "properly researched facts" to the public. Her book, beat IBS, discusses ways you can find *your* cause/s of irritable bowel syndrome (IBS), how to deal with the causes you've identified, and ways you can heal your gut and strengthen your digestive system to achieve optimal health.[1]

This book consists of a 5-step plan that focus on cause identification & strengthening of the digestive tract. To summarize the plan, it enables you to find and remove what should not be in your gastrointestinal tract (*Remove the bad*), check for what you require for optimal digestion but what you may lack (*Replace the good*), aid in re-introducing beneficial bacteria (*Re-inoculate*), heal any injury or inflammation (*Repair the digestive tract*), and learn how to eat healthily to maintain proper digestion (*Eat well to protect*).[1]

Research has shown irritable bowel syndrome to be one of the most prevalent functional gastrointestinal disorders.[2] The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) defines it as a group of symptoms that develop simultaneously, like persistent abdominal pain and alteration in bowel habits, like diabetes and constipation.[3] In IBS, these symptoms manifest without any indicators of impairment in the digestive tract that can be dangerous.

Its prevalence is predicted to be around 11% in the general populace.[2] Women are twice as inclined to be at risk than men and individuals younger than 50 years are more susceptible to IBS compared to those older than 50 years.[3] The Rome Criteria is used to diagnose irritable bowel syndrome, with Rome III being used since 2006 and Rome IV being the updated and revised version published in 2016.[4]

Among several factors that influence the pathogenesis of IBS, diet is a determinant that can play a key role in its risk.[2] In her book Hilda discusses specific foods that should be avoided or completely removed from the diet because they may trigger or worsen symptoms, while also explaining the best foods for consumption to strengthen the digestive tract.

Her general dietary advice is to eat "natural, whole, unprocessed foods" which should be consumed "fresh and as nature intended". By this, she means fresh organic vegetables and meat, some whole fruits, and eggs etc. The foods that are neither smoked nor fried and don't have any artificial additives in them. Hilda also mentions the foods that should be excluded from the diet and has a negative view of highly processed foods which consist of processed oils, pasta, bread, breakfast cereals, cakes, and candies etc. She is of the firm belief that these are "bad foods" and should be completely removed from the diet.[1]

Ultra-processed foods (UPF) are manufactured in industries by the combination of foods and artificial additives. It occurs in a multi-step process to make the end product.[5] They are known to be highly convenient, palatable, and delicious food items that frequently replace unprocessed and minimally processed foods in the diet. Western countries in particular have seen a rise in consumption over the last few decades.[5]

Keeping the prevalence rates of both ultra-processed food intake and irritable bowel syndrome in mind, it's vital that the populace has a general understanding of what foods have a beneficial impact on health and what foods may result in short or long-term complications and adverse health effects. Digestive problems are common and what foods we eat can influence our gut health.

OBJECTIVES & RATIONALE

PICO Question

In adults (age range 19-45 years) with **self-reported digestive problems** (diarrhea, constipation, and gut inflammation) what is the effect of consuming **unprocessed foods** (fresh organic vegetables, meat, and whole fruits etc.) on **gut problems** compared with consuming **highly processed foods** (processed oils, pasta, bread etc.) over a time period of 3 months?

Objective

To summarize the body of data to assess the relationship of ultra-processed and unprocessed food consumption with digestive problems.

Rationale

The prevalence of ultra-processed food consumption has becoming a rising concern, especially in the Western countries where a good portion of the diet consists of these highly-processed, energy-dense foods. Increasing the intake of these foods has shown to play a role in the pathogenesis of several diseases and worsen health. It's important to know what kind of associations have been formed between processed/unprocessed food and digestive problems in research studies.

The purpose of this systematic review is to see just how much research has been done on irritable bowel syndrome and digestive problems in relation to ultra-processed and unprocessed foods by identifying, appraising, and synthesizing all relevant data.

METHODOLOGY

This systematic review's focus was on adults age range 19-45 years with self-reported digestive issues related to irritable bowel syndrome, which included bowel movement (diarrhea and constipation), abdominal pain, and gut inflammation. Original peer-reviewed studies, conducted on human participants, that have been published in the English language with publication dates ranging from 2017-2023 were considered. Research designs like randomized controlled trials, cohort studies, case-control studies, and cross-sectional studies were included to appraise the literature. Studies that were excluded were reviews, letters, and editorials. After establishing the eligibility criteria, search was conducted via Google Scholar and PubMed.

Key search terms for research included "irritable bowel syndrome" AND "processed food", "irritable bowel syndrome" AND "western diet", and "processed food" AND "gut health". Secondary articles were separated from the primary ones and the relevant secondary studies were extensively looked through for promising primary articles. Abstracts for papers were analyzed and irrelevant papers were rejected based on the eligibility criterion. Total studies amounted to 1095 and after screening for duplicates and checking for eligibility, 6 primary, peer-reviewed papers were included in this systematic review.

The quality assessment for the relevant research papers was done via the QCC (Quality Criteria Checklist) which is a Risk of Bias Tool used by researchers to assess the strength of the evidence. The QCC consists of several questions on relevance and validity and they usually revolve around the research topic, sampling, study population, intervention, outcome measurements, statistical analysis and the interpretation of findings.

Based on the responses to the validity questions, a study is rated either positive (+), negative (-), or neutral (∅). This systematic review rated a paper positive if it adequately addressed the generalizability, inclusion/exclusion criteria, bias, data collection, and analysis. If an article did not address these issues, it was given a negative rating and if the article was in the middle, being neither exceptionally weak nor exceptionally strong, it was rated neutral. The final data was entered into an Evidence Summary Table to compare and contrast the eligible studies.

FINDINGS/RESULTS

Two studies conducted on a web-based French cohort reported on the risk of irritable bowel syndrome with consumption of ultra-processed food.[2,5] One cross-sectional study on 44,350 participants reported on the increased risk of IBS in those who consumed the highly processed western dietary pattern.[2] A prospective cohort study analyzed the dietary patterns of 33,43 participants and found that increased intake of ultra-processed foods was associated with a greater prevalence of IBS.[5]

QCC rating/rationale: Both of these cohort studies were rated positive via the QCC as they specified the research question and inclusion/exclusion criteria, described the study settings in detail, controlled for confounders, used standard, valid, and reliable data collection instruments, and discussed limitations.

Two studies reported on the inflammatory potential of highly processed food.[6,7] The study conducted in Molise, Italy found an association between pro-inflammatory UPF and low-grade inflammation.[6] The results of a study conducted in Iran showed how increasing the intake of pro-inflammatory foods was related to higher odds of IBS, particularly in women.[7]

QCC rating/rationale: The Moli-Sani study was given a neutral rating as it was neither exceptionally strong nor exceptionally weak. It addressed each validity question adequately.

The Iranian study was given a positive rating as it has clearly addressed all the issues of inclusion/exclusion, data collection and analysis, as well as generalizability.

One randomized-controlled trial done in the United States, reported on the association between processed foods and fecal metabolome.[8] Participants either consumed their normal dietary pattern which was the control (CON) or they were given highly-processed, ready-to-eat military ration diet (MRE). The article found that increasing MRE consumption altered the fecal metabolome of the participants taking the diet in comparison to those taking the CON diet.[8]

QCC rating/rationale: RCT was rated positive via the QCC as method of randomization was used to assign participants to groups, inclusion/exclusion criteria were clearly mentioned, protocols were mentioned, and standard, valid, and reliable data collection instruments were used. The study also discussed limitations and bias.

One study assessed the relationship of unprocessed/minimally processed (UMP) and ultra-processed food with bowel function and the outcomes of replacing UPF with UMP.[9] It found that increasing consumption of UPF was associated with higher possibility of constipation but not diarrhea whereas greater intake of unprocessed/minimally processed food was associated with a lower possibility of constipation but not diarrhea. Substituting 50% of UPF with UMP food was associated with a lower possibility of constipation.[9]

QCC rating/rationale: This cross-sectional study was given a neutral rating. It adjusted for various factors using the multivariate analysis. However, there was no discussion on limitations and bias in the study. Participants and setting were not described in detail. The tools used for data collection and analysis were valid and reliable. However, the data used was from the National Health and Nutrition Examination Survey which was conducted in 2005-2010 and is somewhat outdated. This study was selected for the systematic review for

its eligibility and it was the only study that discussed the impact of unprocessed/minimally processed foods on gut problems.

EVIDENCE SUMMARY TABLE

Author/ Year	Study design	Quality rating	Location	Sample size	Age range/ Mean age	Gender	Health outcome
Schnabel L, Buscail C, Sabate JM, et al., 2018	Prospective Cohort Study	(+)	France	33,343	50.4 (SD = 14.0) years	M/F	Functional gastrointestinal disorders
Mignogna C, Costanzo S, Di Castelnuovo A, et al., 2022	Cross-sectional Study	(Ø)	Molise, Italy	24,325	≥ 35 years	M/F	Low-grade inflammation
Buscail C, Sabate JM, Bouchoucha M, et al., 2017	Cross-sectional Study	(+)	France	44,350	49.7 ± 14.3 years	M/F	IBS risk
Lo C, Zhao L, Eurídice Martínez Steele, et al., 2023	Cross-sectional Study	(Ø)	United States	12758	(Study adjusted for age)	M/F	Bowel function
Salari-Moghaddam A, Keshteli AH, Esmaillzadeh A, et al., 2019	Cross-sectional Study	(+)	Iran	3363	18-55 years	M/F	IBS risk
Karl JP, Armstrong NJ, Player RA, et al., 2022	Randomized controlled trial	(+)	United States	54	18-62 years	M/F	Fecal Metabolome

DISCUSSION

The aim of the research question was to assess if eating unprocessed food positively impacted gut problems like diarrhea, constipation, and gut microbiota compared to eating highly processed foods. However, the search didn't yield any papers examining the relationship between unprocessed food and gut problems.

Positive association between ultra-processed food consumption with risk of IBS and changes in gut microbiota was found during the systematic review process. The intake of these foods results in higher prevalence of irritable bowel syndrome.[5] It's also shown to play a role in low-grade inflammation due to their pro-inflammatory nature.[7] Further research needs to be done to properly understand how different degrees of food processing influence IBS symptoms, the diet-gut microbiota interactions and most importantly, the role unprocessed and minimally processed foods play in digestive health and symptoms of irritable bowel syndrome patients.

The strengths of this review included the thorough literature search that was done to discover the most recent research available. All the eligible studies adequately adjusted for potential confounders. The methodology is simple to replicate and the scope of the review was clear. The large sample size for most of the relevant articles might compensate for the lack of adequate research done on this health issue.

Various limitations must be acknowledged. Firstly, most of the eligible studies are cross-sectional studies and the main drawback of this study design is its inability to determine incidence and cause-effect relationships. Secondly, restricting search to PubMed and Google Scholar and not including other databases that may have had relevant research papers on the research question. Thirdly, the cohorts of some of these studies tended to be more health-conscious and hence may not be an adequate representation of the general populace in terms of food intake. Lastly, misclassification of foods via NOVA cannot be ruled out in the studies.

The research questions aim was to assess the relationship of “highly processed” and “unprocessed” food with gut problems. One reason I might’ve ended up with these results may have been due to using such generalized terms. If I had to go about my research in a different way, I would’ve focused on more specific relationships like evaluating the association between healthy dietary patterns (DASH and Mediterranean) with gut problems since these diets tend to contain “unprocessed foods”.

Ultra-processed food has been identified as an emerging health threat. Consumption of these highly refined foods and detrimental health outcomes offer insights regarding guidelines and dietary policy. It is evident that ultra-processed food consumption needs to be decreased for better health. This systematic review revealed a lack of experimental and longitudinal research examining IBS symptoms with different levels of food processing, especially

unprocessed food. It's vital that this area of research is explored to better understand different relationships and to draw conclusions that are more accurate and reliable.

CONCLUSION

This study showed a positive association between UPF intake and risk of irritable bowel syndrome and changes in gut microbiota. Search yielded no results on how unprocessed and minimally processed food impacts gut problems. These outcomes encourage a decrease in consumption of ultra-processed foods for optimal health. However, large-scale experimental and longitudinal studies are required to better understand the complex relationship of food processing and IBS problems to draw more reliable and accurate conclusions.

REFERENCE

1. Glickman H. Beat IBS: A Simple, Five-Step Plan for Restoring Your Digestive Health. Robinson; 2017. Accessed March 5, 2024. https://www.amazon.com/Beat-IBS-five-step-restoring-digestive/dp/1472136853

2. Buscail C, Sabate JM, Bouchoucha M, et al. Western Dietary Pattern Is Associated with Irritable Bowel Syndrome in the French NutriNet Cohort. *Nutrients*. 2017;9(9):986. Published 2017 Sep 7. doi:10.3390/nu9090986

3. National Institute of Diabetes and Digestive and Kidney Diseases. Irritable Bowel Syndrome (IBS). National Institute of Diabetes and Digestive and Kidney Diseases. Published January 16, 2019. https://www.niddk.nih.gov/health-information/digestive-diseases/irritable-bowel-syndrome

4. Oka P, Parr H, Barberio B, Black CJ, Savarino EV, Ford AC. Global prevalence of irritable bowel syndrome according to Rome III or IV criteria: a systematic review and meta-analysis [published correction appears in Lancet Gastroenterol Hepatol. 2020 Dec;5(12):e8]. *Lancet Gastroenterol Hepatol*. 2020;5(10):908-917. doi:10.1016/S2468-1253(20)30217-X

5. Schnabel L, Buscail C, Sabate JM, et al. Association Between Ultra-Processed Food Consumption and Functional Gastrointestinal Disorders: Results From the French NutriNet-Santé Cohort. *Am J Gastroenterol*. 2018;113(8):1217-1228. doi:10.1038/s41395-018-0137-1

6. Mignogna C, Costanzo S, Di Castelnuovo A, et al. The inflammatory potential of the diet as a link between food processing and low-grade inflammatiom: An analysis on 21,315 participants to the Moli-sani study. *Clin Nutr*. 2022;41(10):2226-2234. doi:10.1016/j.clnu.2022.08.020

7. Salari-Moghaddam A, Keshteli AH, Esmaillzadeh A, Adibi P. Adherence to the pro-inflammatory diet in relation to prevalence of irritable bowel syndrome. *Nutr j*. 2019;18(1):72. Published 2019 Nov 11. doi:10.1186/s12937-019-0487-6

8. Karl JP, Armstrong NJ, Player RA, Rood JC, Soares JW, McClung HL. The Fecal Metabolome Links Diet Composition, Foacidic positive ion conditions, chromatographicallyod Processing, and the Gut Microbiota to Gastrointestinal Health in a Randomized Trial of Adults Consuming a Processed Diet [published correction appears in J Nutr. 2023 May;153(5):1658]. *J Nutr*. 2022;152(11):2343-2357. doi:10.1093/jn/nxac161

9. Lo C, Zhao L, Eurídice Martínez Steele, et al. S683 Association of Ultra-Processed Food and Unprocessed or Minimally Processed Food Consumption With Bowel Function Among US Adults. *The American Journal of Gastroenterology*. 2023;118(10S):S499-S500. doi:https://doi.org/10.14309/01.ajg.0000952372.70705.ed