International Journal of Innovative Technologies in Social Science

e-ISSN: 2544-9435

Operating Publisher
SciFormat Publishing Inc.
ISNI: 0000 0005 1449 8214

2734 17 Avenue SW,
Calgary, Alberta, T3E0A7,
Canada
+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	KETOGENIC DIET AS A POTENTIAL INTERVENTION FOR THE CURRENT OBESITY CRISIS AND THE ASSOCIATED TYPE 2 DIABETES
DOI	https://doi.org/10.31435/ijitss.2(50).2026.5516
RECEIVED	20 March 2026
ACCEPTED	28 June 2026
PUBLISHED	30 June 2026
LICENSE	The article is licensed under a **Creative Commons Attribution 4.0 International License.**

KETOGENIC DIET AS A POTENTIAL INTERVENTION FOR THE CURRENT OBESITY CRISIS AND THE ASSOCIATED TYPE 2 DIABETES

Krystian Andryszko *(Corresponding Author, Email: kandryszko@gmail.com)*
Clinical Regional Hospital of Saint Jadwiga The Queen in Rzeszów, Lwowska 60, 35-301 Rzeszów, Poland
ORCID ID: 0009-0006-6170-5663

Marcelina Dymon
University of Rzeszow, Rzeszow, Poland
ORCID ID: 0009-0000-8008-7932

Daria Aleksandra Warzocha-Żurek
Clinical Provincial Hospital in Rzeszow, Lwowska 60, 35-301 Rzeszow, Poland
ORCID ID: 0009-0005-5756-2404

Agnieszka Szwed
MSWiA Hospital, Krakowska 16, 35-111 Rzeszow, Poland
ORCID ID: 0009-0003-6395-5365

Ewa Maria Polewczak-Karp
Medical Center in Łańcut Sp. z o.o., Ignacego Paderewskiego 5, 37-100 Łańcut, Poland
ORCID ID: 0009-0006-6411-4826

Natalia Ziemba-Furgała
Ministry of Interior and Administration Hospital in Rzeszów, Krakowska 16, 35-111 Rzeszów, Poland
ORCID ID: 0009-0009-5031-3930

Aleksandra Sołtys
Uniwersytet Rzeszowski, Rzeszów, Poland
ORCID ID: 0009-0007-2557-2696

Katarzyna Anna Borzęcka
Medical Center in Łańcut Sp. z o.o., Ignacego Paderewskiego 5, 37-100 Łańcut, Poland
ORCID ID: 0009-0007-4084-4370

Paulina Krysa
City Hospital of John Paul II in Rzeszów, Rycerska 4, 35-241 Rzeszów, Poland
ORCID ID: 0009-0000-6633-3586

Katarzyna Wawrzonek
Clinical Provincial Hospital of Saint Jadwiga the Queen in Rzeszów, Poland
ORCID ID: 0009-0007-6883-422X

ABSTRACT

The worldwide obesity epidemic is making a turn for the worse with the ever-increasing consumption of ultraprocessed food through economically affected lifestyle changes. Obesity has become a leading cause of global mortality and morbidity. This review analyses the literature from the past 6 years to inspect the correlation between modern lifestyle, unprocessed diets, body weight changes affected by common diets, while taking into consideration the feasibility of adapting the ketogenic diet, considering both its advantageous and adverse effects on global obesity reduction, focusing more on patients who suffer from type 2 diabetes. Quantitative synthesis of variable types of research from meta-analyses, randomized trials, large-scale ecological studies from distinguished databases, evaluated the caloric net data, food processing classifications such as NOVA or HISS, energy expenditure equanimity, weight loss, glycemic control, lipids, and common adverse effects. The results show a strong statistical interdependence between the degree of consumption of ultraprocessed foods and higher body fat percentage, and reduced satiety, independent of caloric intake. Ketogenic diets that underwent evaluation demonstrated superior mean weight loss, improved glycated hemoglobin, reduced triglycerides, and increased HDL, compared with the control groups, with very low rates of ketoacidosis. The ketogenic diet is far from optimal, as it carries with it some risks, such as micronutrient deficiencies and drug interactions. A well-formulated ketogenic diet, with adherence to dietary guidelines, frequent morphological tests, and proper management of medication, offers an effective strategy in battling the global obesity and type 2 diabetes epidemic when properly monitored and supplemented.

KEYWORDS

Ultraprocessed, Obesity, Ketogenic Diet, Type 2 Diabetes, Body Fat Percentage, Weight Loss

CITATION

Krystian Andryszko, Marcelina Dymon, Daria Aleksandra Warzocha-Żurek, Agnieszka Szwed, Ewa Maria Polewczak-Karp, Natalia Ziemba-Furgała, Aleksandra Sołtys, Katarzyna Anna Borzęcka, Paulina Krysa, Katarzyna Wawrzonek. (2026) Ketogenic Diet as a Potential Intervention for the Current Obesity Crisis and the Associated Type 2 Diabetes. *International Journal of Innovative Technologies in Social Science*. 2(50). doi: 10.31435/ijitss.2(50).2026.5516

Introduction

With the rise of consumerism and advances in food science, society has moved further away from what was once widely considered food. Economic development is causing a higher prevalence of obesity. As economies grow, their citizens are less likely to suffer from hunger. A rapidly growing number of food varieties promotes pleasure from consumption. Intelligent media campaigns, flashy packaging, and celebrity promotions target all age groups. The most detrimental effect is seen in children and young adults. According to a recent study by Zheng (2024), obesity is the single greatest cause of global mortality and morbidity. It is a growing trend. Between 1990 and 2021, global deaths attributed to high BMI increased by a factor of 2.5. The most up-to-date data states: "In 2021, there was an estimated incidence of 3.7 million deaths and an estimated prevalence of 128.5 million cases of DALYs" (disability-adjusted life years). The six leading underlying causes of obesity were: "diabetes type 2, ischemic heart disease, hypertensive heart disease, chronic kidney disease, low back pain, and stroke." In addition, a study by Zhang, P., & Liang, X. H. (2022), a meta-analysis with more than 200,000 participants, "showed that the prevalence of T2D was 1.3% (95% confidence interval (CI), 0.6-2.1%) in obese subjects, which was 13 times that in normal weight subjects (0.1%, 95% CI, 0.01-0.2%)". Through thorough statistical analysis, a relationship was found: "BMI was positively correlated with the prevalence of T2D, prediabetes, and glycometabolic indices in obese children and adolescents."

Using a simple logical approach, one might conclude that obesity is solely determined by net caloric balance—calories consumed versus calories expended. However, this perspective oversimplifies the issue. The obesity crisis is more complex. Its distribution is not uniform across countries globally. Factors such as gender, age, and a country's economic state all influence obesity prevalence. A study from July 2025, titled "Energy expenditure and obesity across the economic spectrum," highlights global differences in obesity determinants. These will be discussed in later paragraphs to provide a deeper understanding of these complex interactions.

This research paper aims to analyze recent literature, identify links between modern lifestyles and obesity, assess whether a ketogenic diet can reduce obesity globally, and cautiously examine potential risks for those with the six most common underlying causes of obesity.

Methodology

Data collection was conducted through in-depth qualitative analysis of scientific papers published over the past 6 years on popular sites such as the National Library of Medicine, PNAS.org, Springer Nature Link, MDPI, and finally Diabetes, Obesity and Metabolism, a Journal of Pharmacology and Therapeutics. The mentioned journals are open access, which allowed the authors to minimize the production costs of this review article. Academic publications ranged from large-scale data reviews and meta-analyses to comparative studies and, finally, research studies that gathered information from national healthcare systems and large-scale reviews. The content of the mentioned papers was evaluated based on the test subject pool size, the time span of data collection, and the statistical analyses supporting the strength of the claims regarding data correlation, which allowed the authors to identify the risk groups and apply that knowledge in scientific reasoning. Variability in titles ensured a broad net was cast to capture a diverse pool of data. Based on the provided data trends, a schematic was created to determine whether it would be beneficial for people to adhere to a ketogenic diet, what the benefits and risks of implementing such a diet are, and whether it would be feasible to implement it on a large scale. Lastly, through the interpretation of limitations in the cited literature, a discussion panel of authors discussed the limitations of research and potential future improvements to optimize patient outcomes. The contents of this review paper were optimized for clarity and accuracy, and the language was made more direct to make the review as straightforward and understandable as possible.

Results

Worldwide data regarding obesity and other obesity related data

The trend between obesity and economic development was observed in the IAEA DLW Database Consortium (2025). There was a direct linear relationship, showing that the higher the economic development, the higher, on average, BMI and absolute body mass in the society. The study defined obesity as a BMI of 30kg/m2 or greater.

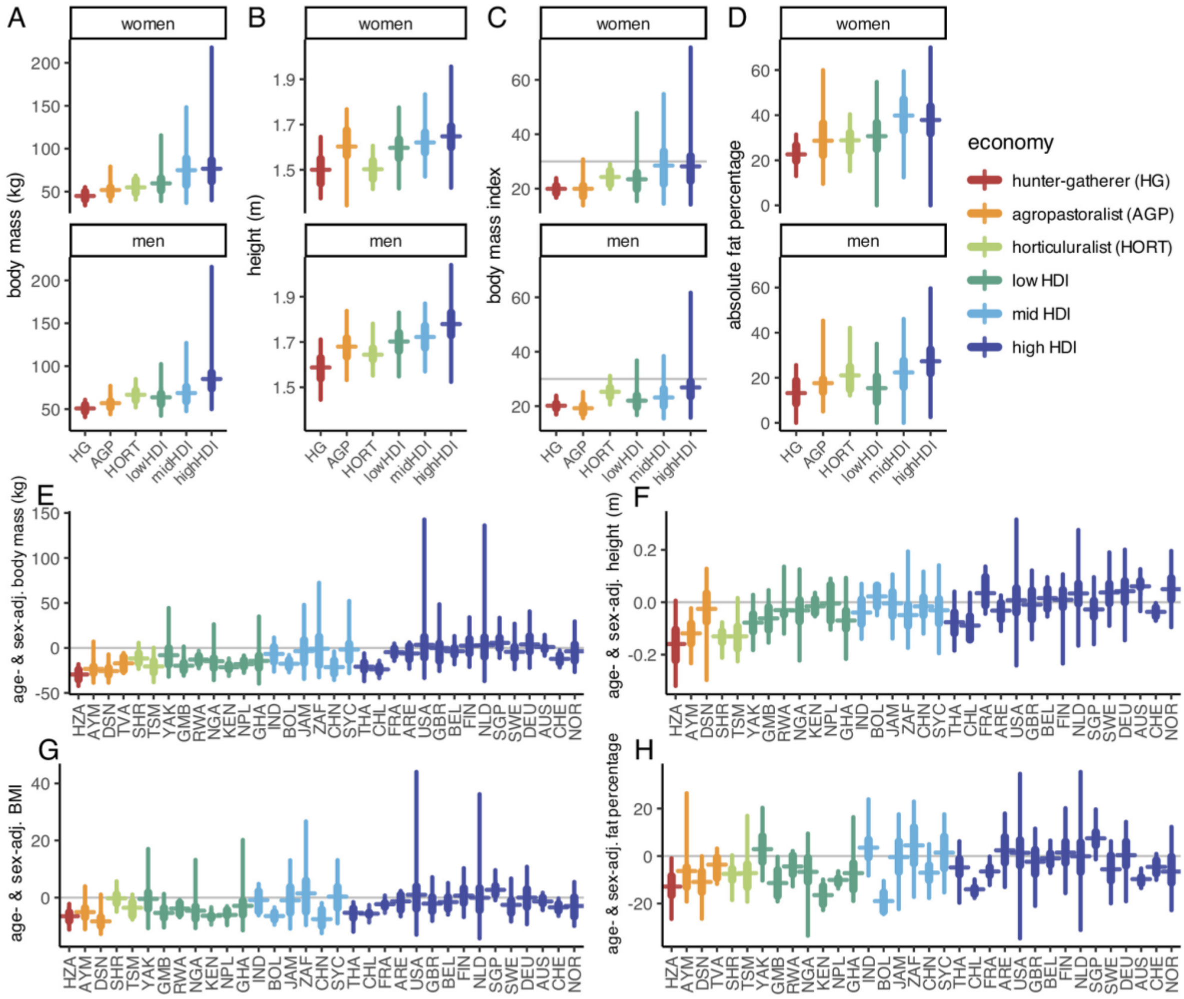

Fig. 1. Data regarding the Economies and corresponding data: body mass (kg), height in (m), BMI, and absolute fat percentage.

Note: From " McGrosky, A., Luke, A., Arab, L., Bedu-Addo, K., Bonomi, A. G., Bovet, P., Brage, S., Buchowski, M. S., Butte, N., Camps, S. G., Casper, R., Cummings, D. K., Krupa Das, S., Deb, S., Dugas, L. R., Ekelund, U., Forrester, T., Fudge, B. W., Gillingham, M., Goris, A. H., … IAEA DLW Database Consortium (2025). Energy expenditure and obesity across the economic spectrum. *Proceedings of the National Academy of Sciences of the United States of America*, *122*(29), e2420902122. https://doi.org/10.1073/pnas.2420902122"

According to the graphs A-D from Figure 1, it shows that for men and women alike, body mass, BMI, and fat percentage are increasing with economies going from low tier to high in the development index. What is interesting is that, contrary to popular opinion, the mean energy expenditure also increases, following the same trend, as shown in Figure 2 below.

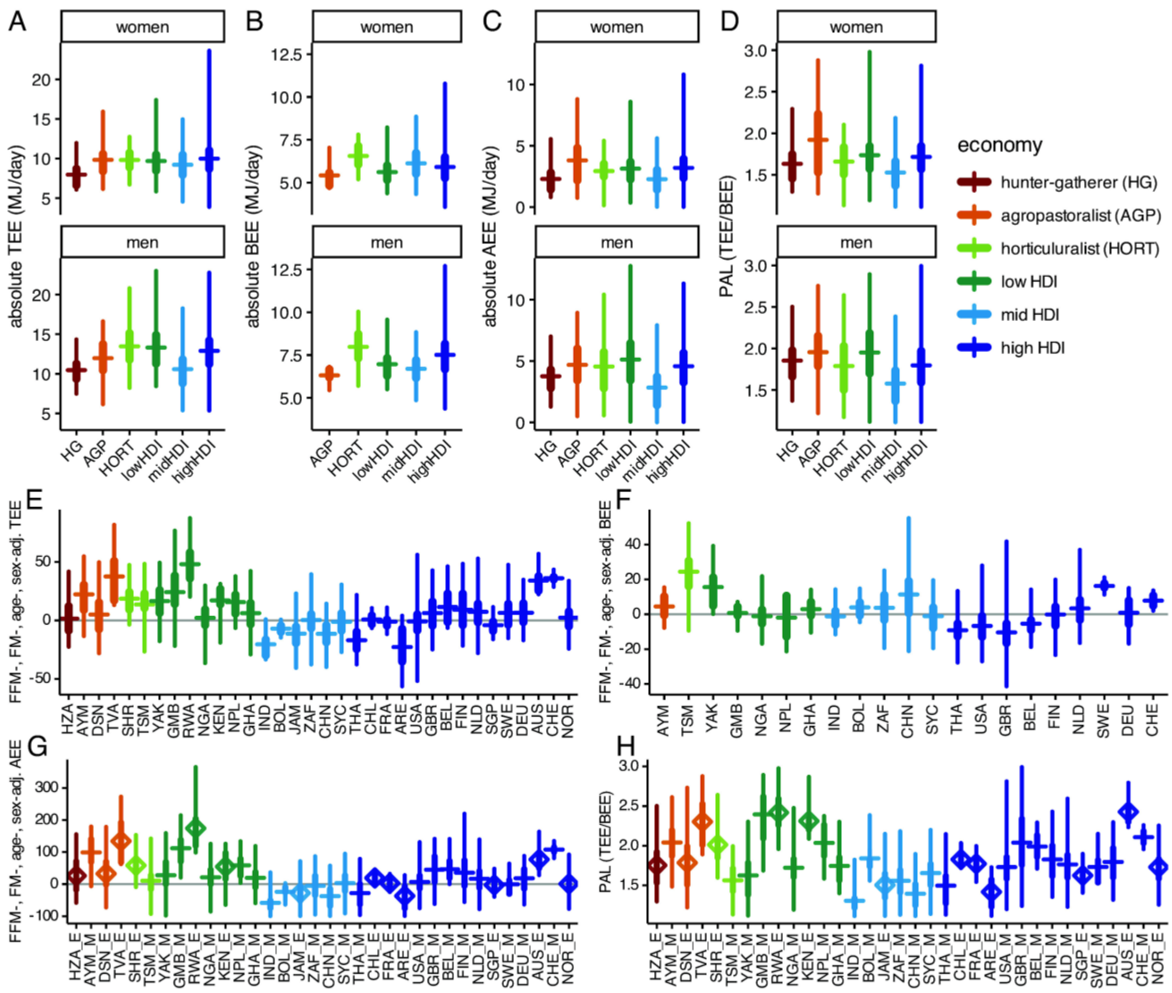

Fig. 2. *Data regarding the energy expenditure across economies.*

"(*E–H*) Adjusted expenditures, calculated from residuals from multiple regression with FFM, FM, age, and sex, varied considerably within and between populations. "AEE=activity energy expenditure, TEE=total energy expenditure, BEE=Basal energy expenditure

Note: From " McGrosky, A., Luke, A., Arab, L., Bedu-Addo, K., Bonomi, A. G., Bovet, P., Brage, S., Buchowski, M. S., Butte, N., Camps, S. G., Casper, R., Cummings, D. K., Krupa Das, S., Deb, S., Dugas, L. R., Ekelund, U., Forrester, T., Fudge, B. W., Gillingham, M., Goris, A. H., … IAEA DLW Database Consortium (2025). Energy expenditure and obesity across the economic spectrum. *Proceedings of the National Academy of Sciences of the United States of America*, *122*(29), e2420902122. https://doi.org/10.1073/pnas.2420902122"

The Ultraprocessed diet and Body Fat percentage

The disparity between Activity Energy expenditure and Total energy expenditure across economies is due to the fact that people in more developed countries have, on average, higher body mass and, more importantly, a higher absolute fat percentage; therefore, their energy expenditure in movement alone is higher. According to the authors of said study. “The percentage of daily calorie intake from UPF was positively associated with body fat percentage in bivariate analyses and in multiple regression including FFM-adjusted total expenditure, age, sex, and HDI rank.” This is partially represented by the next figure:

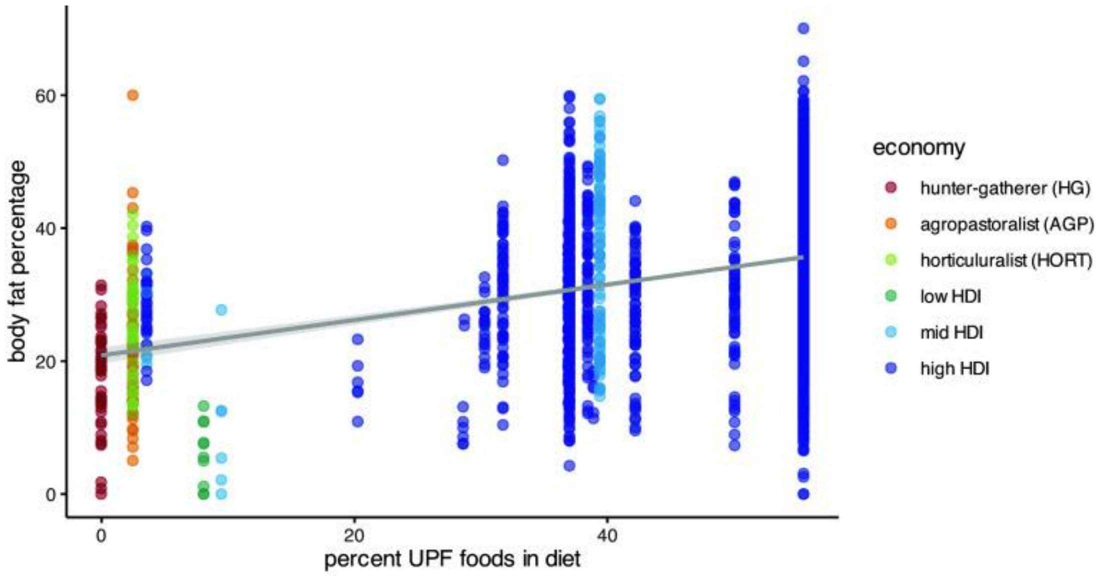

Fig. 3. *Correlation between ultraprocessed foods in the diet and body fat percentage across countries.*

Note: From “ McGrosky, A., Luke, A., Arab, L., Bedu-Addo, K., Bonomi, A. G., Bovet, P., Brage, S., Buchowski, M. S., Butte, N., Camps, S. G., Casper, R., Cummings, D. K., Krupa Das, S., Deb, S., Dugas, L. R., Ekelund, U., Forrester, T., Fudge, B. W., Gillingham, M., Goris, A. H., … IAEA DLW Database Consortium (2025). Energy expenditure and obesity across the economic spectrum. *Proceedings of the National Academy of Sciences of the United States of America*, *122*(29), e2420902122. https://doi.org/10.1073/pnas.2420902122“

Table 1. Data confirming significant effects of $p<0.01$, ergo proportionality between percentage body fat and % ultraprocessed diet consumed.

	Percentage Body Fat							
intercept	**20.35*** (0.61)**	**20.05*** (0.99)**	**22.32*** (0.66)**	**24.40*** (0.92)**	**24.85*** (0.98)**	**24.60*** (0.97)**	**30.10*** (0.80)**	**25.14*** (0.99)**
FFM-adj. TEE	--	--	--	--	-2.49* (1.08)	--	--	-2.97** (1.11)
age	--	--	**0.14*** (0.01)**	**0.15*** (0.01)**	**0.14*** (0.01)**	**0.14*** (0.01)**	**0.16*** (0.01)**	**0.14*** (0.01)**
sex-M	--	--	-10.74*** (0.30)	-10.82*** (0.30)	-10.77*** (0.30)	-10.82*** (0.30)	-11.66*** (0.29)	-10.76*** (0.30)
HDI rank	--	0.002 (0.006)	--	-0.02*** (0.005)	-0.02*** (0.005)	-0.02* (0.01)	-0.04*** (0.004)	-0.02*** (0.01)
% UPF	**0.27*** (0.01)**	**0.28*** (0.02)**	**0.20*** (0.01)**	**0.16*** (0.02)**	**0.15*** (0.02)**	**0.17** (0.02)**	--	**0.16*** (0.02)**
kg_meat per capita	--	--	--	--	--	-0.005 (0.01)	**0.03*** (0.01)**	-0.004 (0.01)
R2	0.12	0.12	0.36	0.36	0.37	0.35	0.35	0.35
n	3649	3649	3649	3649	3649	3564	3564	3564

Note: From PNAS Supporting Information *from "* McGrosky, A., Luke, A., Arab, L., Bedu-Addo, K., Bonomi, A. G., Bovet, P., Brage, S., Buchowski, M. S., Butte, N., Camps, S. G., Casper, R., Cummings, D. K., Krupa Das, S., Deb, S., Dugas, L. R., Ekelund, U., Forrester, T., Fudge, B. W., Gillingham, M., Goris, A. H., … IAEA DLW Database Consortium (2025). Energy expenditure and obesity across the economic spectrum. *Proceedings of the National Academy of Sciences of the United States of America*, *122*(29), e2420902122. https://doi.org/10.1073/pnas.2420902122"

Since caloric intake and the degree of consumption of processed foods in the diet are closely associated with body fat percentage according to the IAEA DLW Database Consortium (2025), a logical approach in battling the increasingly evident fat epidemic would be a diet poor in ultraprocessed products, and one that, with decreased caloric intake, would not cause hunger and overeating.

Ultraprocessed variability trial and weight loss

To clinically confirm the reliability of the data presented in the graphs and the table above, it is crucial to examine the crossover trial conducted in the United Kingdom, the results of which were presented last year. Dicken et al. (2025) demonstrated that even when following the healthy dietary guidelines, it is more difficult to lose weight on an ultraprocessed diet than on a minimally processed diet. In this study, 55 people with BMI ranging from 25 to 40, who derived approximately 67% of their calories from ultraprocessed products. The trial used an ad libitum design, which allowed the investigators to examine the real-world effects of food processing level on energy intake and body weight, while both diets strictly followed the UK Eatwell Guide nutrient and food-group recommendations. The actual caloric intake varied daily during the trial; there was no control over portion sizes or the frequency of consumption for each participant. Participants were told to eat as much as they wanted from the available 4000kcal per day.

Throughout the study, test subjects completed questionnaires assessing their physical and mental states. Their consumption was closely observed. The average caloric intake relative to habitual consumption was lower for the minimally processed and ultraprocessed stages of the diet. The 'selective' caloric intake during the stages of the minimally processed diet was lower by choice, even to a greater degree than on the ultraprocessed diet, with the provided food choices.

Compared with the baseline habitual consumption, participants on the minimally processed diet consumed, on average, 503,7 kcal/day less, while participants on the ultraprocessed diet consumed only 289,6 kcal/day less. Given that during both randomized stages there was a caloric deficit compared to the baseline, both groups experienced weight loss. Negative weight change for the stages of the minimally processed diet was larger.

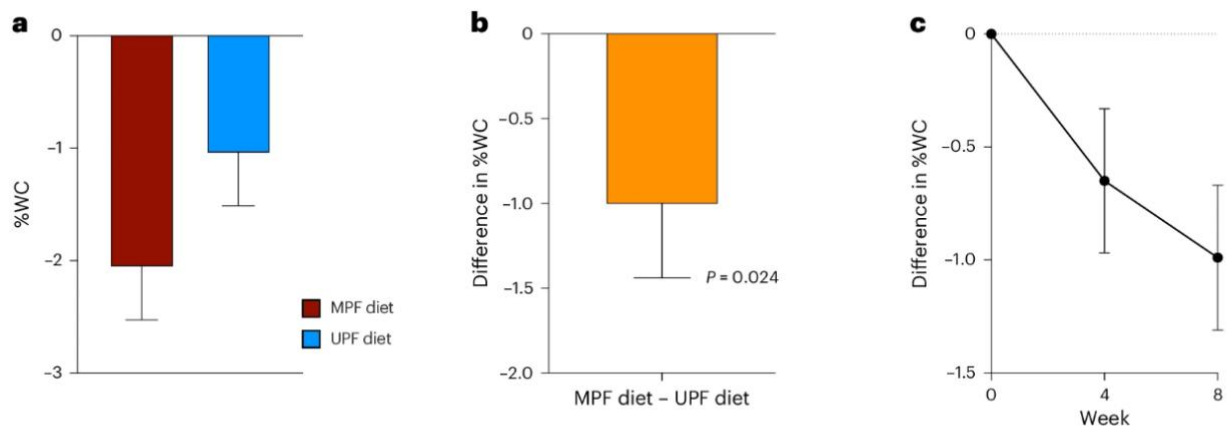

Fig. 4. *Percentage weight decrease on minimally processed and ultra-processed diets.*

Note: From Dicken, S.J., Jassil, F.C., Brown, A. *et al.* Ultraprocessed or minimally processed diets following healthy dietary guidelines on weight and cardiometabolic health: a randomized, crossover trial. *Nat Med* 31, 3297–3308 (2025). https://doi.org/10.1038/s41591-025-03842-0

The primary outcome of this trial was the fact that consumption of a minimally processed diet resulted in approximately a doubling in weight loss by percentage in comparison to an ultraprocessed diet- mean difference of about 1,01%. This study suggests that the degree of consumption of ultraprocessed foods affects satiety and energy intake, thereby inadvertently affecting weight and body fat mass.

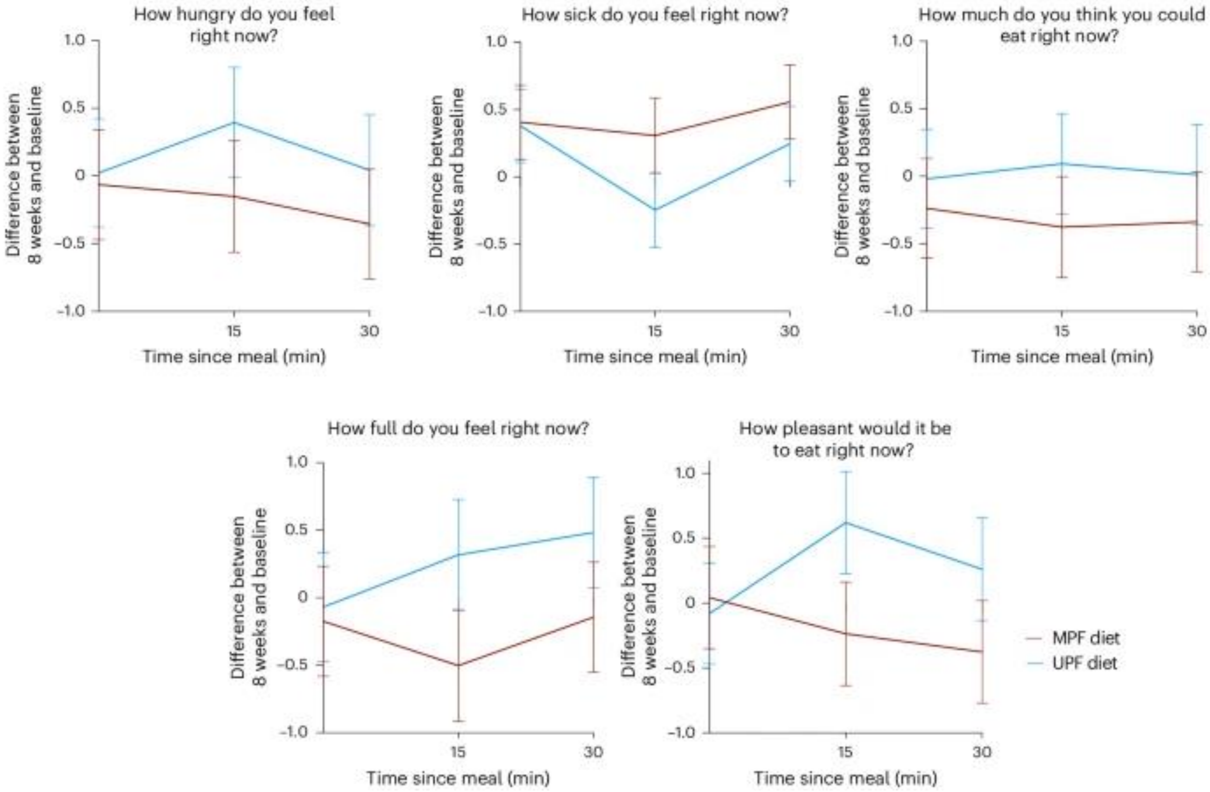

***Fig. 5.** Questionnaire outcomes regarding satiety in test subjects*

Note: From Dicken, S.J., Jassil, F.C., Brown, A. *et al.* Ultraprocessed or minimally processed diets following healthy dietary guidelines on weight and cardiometabolic health: a randomized, crossover trial. *Nat Med* 31, 3297–3308 (2025). https://doi.org/10.1038/s41591-025-03842-0

As shown in Figure 5, the hunger measure was lower on the minimally processed diet. In addition, the degree to which a participant predicted his or her ability to consume more food was also lower in a minimally processed diet.

Ultraprocessed composition of popular weight loss diets

Another stage of this review is to represent the variability of popular dietary options and compare them. This was exactly researched by Zinn, C. (2024). Four common diets were compared in terms of the extent to which their composition included ultraprocessed ingredients. An 82-item food-frequency questionnaire was completed by 168 adults who adhered to a single dietary pattern for at least 6 months. The participants in this study were divided into 4 dietary pattern subgroups: ketogenic diet, low-carbohydrate healthy-fat diet, vegetarian, and vegan (plant-based). All four of these diets are widely used for weight loss, although vegan and vegetarian diets are also used for moral reasons. This study aimed mainly to compare the qualities of these four diets using two classification systems: NOVA and the Human Interference Scoring System. The NOVA system consists of 4 levels, where 1 indicates minimally processed foods such as fresh or frozen fruits, meats, simple grains (such as rice or lentils), nuts, and seeds, and milk products such as yogurt. NOVA 4, on the other hand, consists of ultraprocessed industrial products. These would include, for example, sugary soda drinks, breakfast cereals, processed meats, plant-based meat alternatives, candy, ice cream, and fast food. While the IAEA DLW Database Consortium (2025) showed that diets consisting of only one of these NOVA groups can meet the dietary guidelines, the substantial difference in weight loss between ultraprocessed and minimally processed foods makes it worthwhile to minimize consumption of products from the NOVA 4 group.

HISS classification, on the other hand, was developed about 2 years ago as a successor of the NOVA classification. While NOVA emphasizes the level of processed ingredients, the HISS classification focuses on the meal itself rather than just its components. It is better at conveying the gradual increase in processing from old-school to modern methods. Because of these differences, it is a more practical and improved alternative to the NOVA- it asserts mixed dishes that are composed of variable ingredients that may not be in the same NOVA group.

Table 2. Dietary mean % proportion values representing the division into NOVA and HISS categories for each of the four diets.

Diet pattern	*N*	NOVA 1 (Mean % ± SD)	NOVA 2 (Mean % ± SD)	NOVA 3 (Mean % ± SD)	NOVA 4 (Mean % ± SD)	HISS 1 (Mean % ± SD)	HISS 2 (Mean % ± SD)	HISS 3 (Mean % ± SD)	HISS 4 (Mean % ± SD)
KD	56	53 ± 12[a]	12 ± 8	21 ± 10	15 ± 12[c]	42 ± 13	32 ± 10[e]	12 ± 8	14 ± 13[g]
LCHF	66	51 ± 13	8 ± 5	23 ± 10	18 ± 12[c]	42 ± 11	28 ± 10	11 ± 8	18 ± 12[gh]
VGN	14	42 ± 18[b]	3 ± 3	22 ± 10	32 ± 51[d]	44 ± 20	14 ± 6[f]	11 ± 8	30 ± 15[hi]
VEGE	32	42 ± 15	4 ± 3	26 ± 8	28 ± 15[d]	37 ± 13	21 ± 8[f]	13 ± 8	30 ± 15[i]

Note: De La Motte, K. L., Campbell, J. L., & Zinn, C. (2024). Exploring Consumption of Ultra-Processed Foods and Diet Quality in the Context of Popular Low Carbohydrate and Plant-Based Dietary Approaches. *Food science & nutrition*, *12*(11), 9651–9663. https://doi.org/10.1002/fsn3.4496

Analysis of all four diets, divided into NOVA groups (Table 2), showed that their compositions differed. A statistical one-way ANOVA ($p<0.001$), post hoc Tukey's HSD tests were performed. The outcome was that the Ketogenic Diet was significantly lower in ultraprocessed foods than the vegan diet. A low-carbohydrate, healthy-fat diet was significantly less processed than the vegan and vegetarian diets.

In the HISS classification, the difference in mean % in HISS 1 was small between these diets; the Vegan and Vegetarian diets showed substantially higher mean % values. In addition, the HISS 2 mean % values were significantly higher on KD and LCHF diets than on plan-based diets.

Table 3. Mean proportion of NOVA % by food category among the four popular diets. The missing numbers indicate the absence of allocation of this subgroup in the diet, so a value of 0.

Mean proportion of NOVA % by food category among the four popular diets.

	KD mean NOVA % per food group				LCHF mean NOVA % per food group				VGN mean NOVA % per food group				VEGE mean NOVA % per food group			
Food categories	N1	N2	N3	N4	N1	N2	N3	N4	N1	N2	N3	N4	N1	N2	N3	N4
Fruit and veg	13		2		18		2		27		4		22		4	
Grains and substitutes	1		1	3	2		2	5	8		1	9	4		3	9
Dairy and substitutes	7		9	1	6		8	2	0		8	3	4		7	3
Legumes, nuts, seeds	3		2	0	6		2	0	6		5	0	6		3	0
Meat, poultry, fish, eggs and substitutes	24		4	4	13		4	3	0		0	6	3		2	3
Cooking fats, sauces and spreads	1	10	3	3	0	8	5	3	0	3	4	5	1	4	5	4
Confectionery and snacks	2		1	3	1		1	5	1		1	6	0		3	8
Convenience and takeout			1	2			1	3			0	4			1	2

Note: De La Motte, K. L., Campbell, J. L., & Zinn, C. (2024). Exploring Consumption of Ultra-Processed Foods and Diet Quality in the Context of Popular Low-Carbohydrate and Plant-Based Dietary Approaches. *Food science & nutrition*, *12*(11), 9651–9663. https://doi.org/10.1002/fsn3.4496

Table 3 is the most significant clinical outcome of the Zinn, C. (2024) study, as it highlights the exact differences in ultraprocessed food consumption (NOVA4) across all four groups.

According to Table 3, the ketogenic diet consists of NOVA4 in approximately 16% (15±12%) and a very low amount of grains. confectionery and snacks, and plant-based alternatives. Not far from it was the low-carbohydrate, healthy-fat diet, with approximately 19% NOVA 4 (18% ± 12%). The results in Table 3 for plant-based diets explain exactly why they contain higher levels of ultraprocessed products. These diets rely too heavily on Grains and substitutes, as well as modern plant-based meat alternatives. In addition, the minimal proportion of grains in the ketogenic diet or these sample groups makes it possible to adapt this diet type for people suffering from celiac disease and grain allergies.

Table 4. Mean proportion of HISS % by food category among the four diets. The missing numbers indicate the absence of allocation of this subgroup in the diet, so a value of 0.

Mean proportion of HISS % by food category among the four diets.

	KD Mean HISS % per food group				LCHF Mean HISS % per food group				VGN Mean HISS % per food group				VEGE Mean HISS % per food group			
Food categories	H1	H2	H3	H4	H1	H2	H3	H4	H1	H2	H3	H4	H1	H2	H3	H4
Fruit and veg	13		2		14		2		27	4			24		4	
Grains and Substitutes	0	0	2	2	1	0	3	3	6	2	3	7	4	1	4	9
Dairy and Substitutes		16		1		10		2		8		3		13		3
Legumes, nuts, seeds	3		2	0	5		1	0	11	0		0	9		1	0
Meat, poultry, Fish, eggs and Substitutes	24	1	1	5	10	1	1	3	0	0	3	3	3	1	2	3
Cooking fats, Sauces and Spreads		12	1	5		8	0	4		4	0	7		7	1	7
Confectionery and snacks		2	1	3		1	1	4		1	1	6		2	2	9
Convenience and takeout			1	2			1	2			0	4			1	3

Note: De La Motte, K. L., Campbell, J. L., & Zinn, C. (2024). Exploring Consumption of Ultra-Processed Foods and Diet Quality in the Context of Popular Low Carbohydrate and Plant-Based Dietary Approaches. *Food science & nutrition*, *12*(11), 9651–9663. https://doi.org/10.1002/fsn3.4496

Table 4 further produces the same ranking as the NOVA classification. Both KD (14%) and LCHF (18%) diets have the lowest proportions of ultraprocessed foods, while, in NOVA, plant-based diets have roughly double the percentage points compared to the other two diets. Because both classification systems produced the same results, it is clear that NOVA's results are not due to its limitations. Furthermore, although all four diets contain fewer ultraprocessed products than modern diets, the results are significant for selecting an optimal diet for weight loss.

Recent Keto Diet Outcomes

A recent meta-analysis shed light on potential outcomes of weight loss on a ketogenic diet. According to the key findings of Zhou et al. (2022), participants on ketogenic diets lost, on average, more body weight than those on other comparative diets, such as low-carbohydrate, low-calorie diets or standard diabetes diets. Considering a substantially large standardized mean difference (SMD=-5.63), a large effect size of this magnitude is far beyond large (which in Cohen's d is categorized as 0.8 or higher), meaning that in comparison to other weight loss diets, the ketogenic diet is far superior. In addition, losing more than 10% of body weight is clinically significant, as it can lead to major improvements in the management of type 2 diabetes or to its complete remission, according to a clinical paper by Taylor, R. (2018). The results of the individual studies are visible in Figure 6.

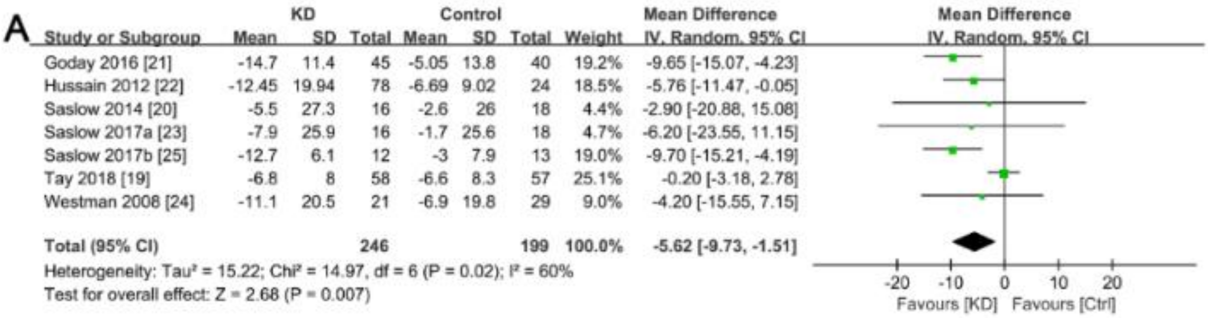

Fig. 6. *Mean difference in body weight for the ketogenic diet vs the control*

Note: From Zhou, C., Wang, M., Liang, J., He, G., & Chen, N. (2022). Ketogenic Diet Benefits to Weight Loss, Glycemic Control, and Lipid Profiles in Overweight Patients with Type 2 Diabetes Mellitus: A Meta-Analysis of Randomized Controlled Trails. *International Journal of Environmental Research and Public Health*, *19*(16), 10429. https://doi.org/10.3390/ijerph191610429

Diabetes Type 2 and the Ketogenic Diet

There are other values that are significant in Zhou et al. (2022) for comparing weight-loss results and improvements in obesity, such as waist circumference, which, in this meta-analysis, also proved significant (SMD =- 2.32). According to the Aging Study Group (2025), a "5% reductions in waist circumference... was also associated with slightly lower mean HbA1c: 0.16%", which in turn meant that there were about "32% lower odds of insulin use" with a decrease of this magnitude. In addition, a "5% decrease in body fat was associated with a 0.15% lower HbA1c," which in turn translated into "21% lower odds of insulin use over time".

The Zhou et al. (2022) results showed that, with the ketogenic diet, the decrease in glycated hemoglobin was also greater than in the control groups (SMD = -0.38), a statistically significant difference but of small to moderate effect size. The results for the following subgroups are shown in Figure 7.

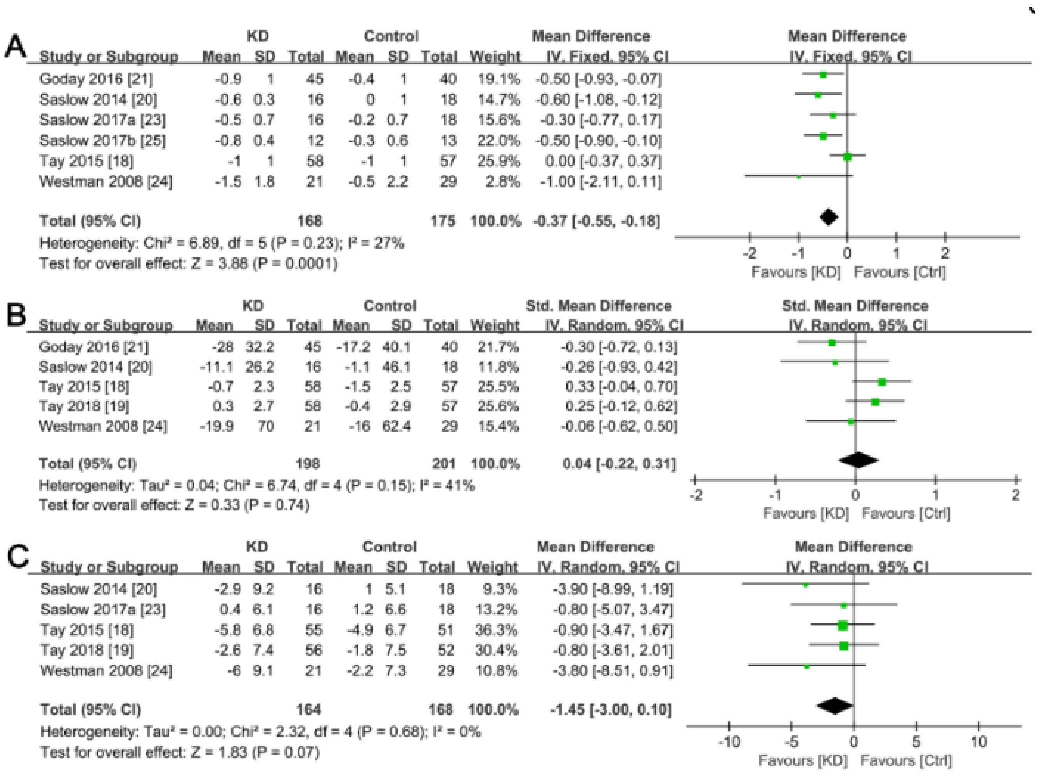

***Fig.** 7. Mean difference in* (A) Changes in HbA1c; (B) Changes in fasting glucose; (C) Changes in fasting insulin.

Note: From Zhou, C., Wang, M., Liang, J., He, G., & Chen, N. (2022). Ketogenic Diet Benefits to Weight Loss, Glycemic Control, and Lipid Profiles in Overweight Patients with Type 2 Diabetes Mellitus: A Meta-Analysis of Randomized Controlled Trails. *International Journal of Environmental Research and Public Health*, *19*(16), 10429. https://doi.org/10.3390/ijerph191610429

Keto vs Lipids

Regarding the effects of the ketogenic diet on lipid levels, the results were clear: triglycerides showed a significant reduction in SMD of −0.36 (Zhou et al., 2022). Moreover, there was a significant increase in HDL levels in SMD, −0.36. The study "found no significant differences with regard to changes in total cholesterol and LDL levels between the ketogenic and non-ketogenic diet groups ($p = 0.97$ and $p = 0.26$, respectively)". This means that bold claims opposing ketogenic diets, based on increased lipid levels in the body and thus an increased risk of lipid-related diseases, are purely speculative and lack any underlying statistical evidence when applied to relatively healthy individuals without genetic mutations in lipid metabolism or other conditions.

Diabetic Ketoacidosis and Illness associated with ketosis

Roberts et al. (2025), in a real-world retrospective follow-up analysis, found a very low incidence of Diabetic Ketoacidosis among patients with a total of more than 72,000 years of follow-up. The study defined diabetic ketoacidosis in patients with diabetes and illness associated with ketosis for "beta-hydroxybutyrate (BHB) levels ≥3 mmol/L" at the time the patient sought in-person care. The incidence was then converted into a rate per 1000 patients. In summary, both IAK and DKA incidence were very low, while the reported mean age of events was around 56±9 years. For all tested patients, the incidence was 1.18 and 0.70 per 1000 for IAK and DKA. For patients without diabetes (about 22,000 patient-years), 0.04 and 0.00 per 1000 for IAK and DKA, respectively. For patients with type 2 diabetes, the incidence was 1.69 and 1.01 per 1000, respectively. It's crucial to note that there was a 7-fold increase in DKA incidence among patients treated with flozins compared with those treated with other pharmacological agents.

Thiamine and Magnesium Levels in Keto

While the ketogenic diet can meet all dietary guidelines established in the previous paragraphs, in an uncontrolled setting, the outcome may differ. The role of B1 in metabolism is fairly established. The insufficiency negatively impacts both the nervous and cardiovascular systems. One of the first real-world comparative studies on B1 levels, Churuangsuk et al. (2024), focused on the statistical differences in micronutrient levels between patients on classical modern, high-carbohydrate diets and those who freely chose to adhere to low-carbohydrate and/or ketogenic regimens. The primary focus on B1 levels in blood concluded that TDP (red blood cell thiamine diphosphate), the best marker for B1 levels, was significantly lower in patients on ketogenic or low-carb diets (407 ± 91 ng/g Hb vs 633 ± 234 ng/g Hb in controls; $p < 0.001$). About 6% of low-carb/keto diet patients were thiamine-deficient (<275 ng/g Hb), compared with only 2% of those on high-carb diets. On the other hand, the study claimed that B1 supplementation corrected the discrepancy and normalized blood levels. Just like with B1 levels, the low-carb/Keto group was more likely to have suffered from hypomagnesemia.

Discussion and Limitations

Although the results speak for themselves, these reviews mention a few adverse effects, which may reflect more convenience-based bias. Human bias is a factor that can never be fully removed from research, despite numerous attempts. With a larger number of adverse effects, there is an improved knowledge-based decision-making regarding putting the patients on ketogenic diets.

In addition, some data, although from 2022, may seem outdated, as almost 4 years have passed, and the likelihood of newer research becoming available is quite high.

The large-sample results regarding the effects of the said diet on patients lacked a more detailed breakdown by gender. For example, Jiao (2025)highlights the differences between men, women, and postmenopausal women and how the ketogenic diet has different outcomes for these subgroups. This review aims to address a large group of individuals who are battling obesity and diabetes. On the other hand, more data regarding the differences between men and women could help in optimizing and consciously selecting ketogenic products in order to further maximize the results.

Another aspect of the review that requires improvement is a more in-depth explanation of the satiety mechanism, including ghrelin, GLP-1, CCK, and the concept of metabolic flexibility. In addition, population-specific environment-driven differences require further research. Due to a wide range of differentiating factors, such as temperature, food product bioavailability, day length, and the use of pesticides in farming, the approach to dietary regimens would benefit from more focused, country- and population-based research to optimize outcomes.

Conclusions

The global epidemic of obesity is caused by overconsumption of ultraprocessed food products in modern industrial diets. One of the direct causes is overeating through decreased satiety, and the addictiveness of easily accessible taste maximized long shelf life products. Throughout this review, a number of meta-analyses, clinical trials, large-scale ecological data, and reviews brought up the evidence that ultraprocessed foods and/or meals consisting of ultraprocessed components are associated with greater adipose fat percentage, larger circumference of the waist, and greatly increased incidence of type 2 diabetes, despite caloric intake control.

Based on the findings mentioned in the review, it seems that the ketogenic diet is a viable option and should be a preferred option in the treatment of obesity and obesity related type 2 diabetes. Not only does it substantially outperform other popular weight-loss diets, but it also contributes to reduced hunger and reduced habit-based consumption of ultraprocessed foods. Once people adhere to the regimen during the 'adaptation period', the improvement in overall well-being is self-evident. Reducing consumption of ultraprocessed foods affects not only the patient's physical health but also their mental health. Nearly non-existent consumption of grains in this diet seems perfect for patients suffering from celiac disease. A ketogenic diet is not limited to young individuals, as promising outcomes are visible in all age groups, regardless of gender. Furthermore, a well-formulated ketogenic diet leads to a decrease in triglyceride levels and an increase in high-density lipoprotein, while low-density lipoprotein shows no association with increased fat intake as a percentage in healthy individuals.

However, the ketogenic diet is not without risks. An improperly composed diet leads to deficiencies. Real-world data indicate a higher prevalence of thiamine deficiency and hypomagnesemia, underscoring the need for careful dietary planning, targeted supplementation, and frequent checkups.

Additionally, there are contraindications for combining flozins with the ketogenic diets as it has an adverse effect on the incidence of diabetic ketoacidosis and ilnesses associated with ketosis. Ketone levels should therefore be measured daily, and each pharmacological addition should be clinically tested first for possible mechanisms of action that may affect the overall outcome.

In the future, dietary guidelines should move away from caloric-based theory centrism towards crucial markers such as the NOVA and HISS classification systems. The public should be educated about the risks associated with consuming ultraprocessed foods. At the same time, supporting access to nutrient-dense, minimally processed products may put forward a superiorly sustainable path towards reversing the global obesity epidemic and type 2 diabetes.

REFERENCES

1. McGrosky, A., Luke, A., Arab, L., Bedu-Addo, K., Bonomi, A. G., Bovet, P., Brage, S., Buchowski, M. S., Butte, N., Camps, S. G., Casper, R., Cummings, D. K., Das, S. K., Deb, S., Dugas, L. R., Ekelund, U., Forrester, T., Fudge, B. W., Gillingham, M., … IAEA DLW Database Consortium. (2025). Energy expenditure and obesity across the economic spectrum. *Proceedings of the National Academy of Sciences of the United States of America, 122*(29), Article e2420902122. https://doi.org/10.1073/pnas.2420902122
2. He, Q. X., Zhao, L., Tong, J. S., Liang, X. Y., Li, R. N., Zhang, P., & Liang, X. H. (2022). The impact of obesity epidemic on type 2 diabetes in children and adolescents: A systematic review and meta-analysis. *Primary Care Diabetes, 16*(6), 736–744. https://doi.org/10.1016/j.pcd.2022.09.006
3. Jiao, Y., Chen, X., Liu, L., Lu, Y., Gao, M., Wang, Q., Chi, X., & Mo, Y. (2025). Sex differences in ketogenic diet: Are men more likely than women to lose weight? *Frontiers in Nutrition, 12*, Article 1600927. https://doi.org/10.3389/fnut.2025.1600927
4. De La Motte, K. L., Campbell, J. L., & Zinn, C. (2024). Exploring consumption of ultra-processed foods and diet quality in the context of popular low carbohydrate and plant-based dietary approaches. *Food Science & Nutrition, 12*(11), 9651–9663. https://doi.org/10.1002/fsn3.4496
5. Zhou, C., Wang, M., Liang, J., He, G., & Chen, N. (2022). Ketogenic diet benefits to weight loss, glycemic control, and lipid profiles in overweight patients with type 2 diabetes mellitus: A meta-analysis of randomized controlled trials. *International Journal of Environmental Research and Public Health, 19*(16), Article 10429. https://doi.org/10.3390/ijerph191610429

6. Roberts, C. G. P., Athinarayanan, S. J., Ratner, R. E., & Umpierrez, G. E. (2025). Illnesses associated with ketosis including diabetic ketoacidosis during very low carbohydrate and ketogenic diets. *Diabetes, Obesity and Metabolism, 27*(5), 2531–2539. https://doi.org/10.1111/dom.16252
7. Li, J., He, W., Wu, Q., Qin, Y., Luo, C., Dai, Z., Long, Y., Yan, P., Huang, W., & Cao, L. (2025). Ketogenic diets and β-hydroxybutyrate in the prevention and treatment of diabetic kidney disease: Current progress and future perspectives. *BMC Nephrology, 26*, Article 127. https://doi.org/10.1186/s12882-025-04019-0
8. Churuangsuk, C., Catchpole, A., Talwar, D., Welsh, P., Sattar, N., Lean, M. E. J., & Combet, E. (2024). Low thiamine status in adults following low-carbohydrate/ketogenic diets: A cross-sectional comparative study of micronutrient intake and status. *European Journal of Nutrition, 63*(7), 2667–2679. https://doi.org/10.1007/s00394-024-03459-y
9. Jaeschke, R., Gajewski, P., & O'Byrne, P. M. (Eds.). (2019). *McMaster textbook of internal medicine 2019/20*. Empendium.
10. Zhou, X.-D., Chen, Q.-F., Yang, W., Zuluaga, M., Targher, G., Byrne, C. D., Valenti, L., Luo, F., Katsouras, C. S., Thaher, O., Misra, A., Ataya, K., Oviedo, R. J., Kong, A. P.-S., Alswat, K., Lonardo, A., Wong, Y. J., Abu-Abeid, A., Al Momani, H., … Zheng, M.-H. (2024). Burden of disease attributable to high body mass index: An analysis of data from the Global Burden of Disease Study 2021. *EClinicalMedicine, 76*, Article 102848. https://doi.org/10.1016/j.eclinm.2024.102848
11. Dicken, S. J., Jassil, F. C., Brown, A., Kalis, M., Stanley, C., Ranson, C., Ruwona, T., Qamar, S., Buck, C., Mallik, R., Hamid, N., Bird, J. M., Brown, A., Norton, B., Gandini Wheeler-Kingshott, C. A. M., Hamer, M., van Tulleken, C., Hall, K. D., Fisher, A., … Batterham, R. L. (2025). Ultraprocessed or minimally processed diets following healthy dietary guidelines on weight and cardiometabolic health: A randomized, crossover trial. *Nature Medicine, 31*(10), 3297–3308. https://doi.org/10.1038/s41591-025-03842-0
12. De La Motte, K. L., Campbell, J. L., & Zinn, C. (2024). Exploring consumption of ultra-processed foods and diet quality in the context of popular low carbohydrate and plant-based dietary approaches. *Food Science & Nutrition, 12*(11), 9651–9663. https://doi.org/10.1002/fsn3.4496
13. Lean, M. E. J., Leslie, W. S., Barnes, A. C., Brosnahan, N., Thom, G., McCombie, L., Peters, C., Zhyzhneuskaya, S., Al-Mrabeh, A., Hollingsworth, K. G., Rodrigues, A. M., Rehackova, L., Adamson, A. J., Sniehotta, F. F., Mathers, J. C., Ross, H. M., McIlvenna, Y., Stefanetti, R., Trenell, M. I., … Taylor, R. (2018). Primary care-led weight management for remission of type 2 diabetes (DiRECT): An open-label, cluster-randomised trial. *The Lancet, 391*(10120), 541–551. https://doi.org/10.1016/S0140-6736(17)33102-1
14. Palmer, R., Neiberg, R. H., Beavers, K. M., Kahn, S. E., Houston, D. K., Wagenknecht, L., Johnson, K. C., Pownall, H. J., Espeland, M. A., & Action for Health in Diabetes (Look AHEAD) Aging Study Group. (2025). Associations between decreases in adiposity and reductions in HbA1c and insulin use in the Look AHEAD cohort. *Obesity, 33*(3), 612–620. https://doi.org/10.1002/oby.24242