

## Keto Diet: Reviewing the summary of contemporary scientific evidence

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### ABSTRACT:

*There is rising public concern of overweight as obesity has become a global pandemic. Popularity of keto diet is also rising for weight reduction. A lot of keto proponent groups, for their own commercial purpose, are attracting public attention and already made a craze about keto diet. Social media is also overloaded with adds of keto products. For revealed temporary benefits, general people and even medical professionals are confused about the true consequences of it. RCTs and meta-analyses of RCTs and even umbrella review of meta-analyses reveal that the weight loss of keto diet is temporary. Some metabolic and biochemical benefits are also disputed by raised LDL-C and other factors that can cause adverse cardiovascular outcome. Therefore keto diet cannot be a public measure and it must be individualized and supervised by medical experts.*

### Key Words:

keto diet, RCT, meta analyses, umbrella review

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### Introduction:

Obesity is a global pandemic. Worldwide adult obesity has more than doubled since 1990. In 2020, over 890 million people were living with obesity. Therefore every 1 in 8 people in the world is now obese.[1]

Bangladesh's obesity prevalence is lower than the regional average (6.2% of adult men and 3.0% of women) and among the lowest in the world.[2]

Still obesity is a source of major concern in Bangladesh for two different reasons:

- As a part of metabolic syndrome, it can raise the burden of Major Adverse Cardiovascular Event (MACE)
- Potential of Global slimming propaganda can create new forms of malnutrition by provoking eating disorders

In the modern era, public opinion is mostly shaped by the digital world of information. Medical literature is creating genuine awareness of obesity, on the other hand social media is driving slimming propaganda by using those medical information[3][4].

### Historical background:

Wilder proposed that a ketogenic diet (KD) be tried in a series of patients with epilepsy in 1921.

In the 1970s, nutritional ketosis was introduced as an idea for weight loss by Dr. Robert Atkins. [5]. Afterwards gradually it became a popular weight loss formula.

### What is Keto Diet (KD):

Keto diet is defined as a low-carbohydrate diet (LCD) with a moderate amount of protein restriction to induce ketosis without restricting fat intake.

50-60% fat,30-35% protein and only 5-10% carbohydrate ie, only 20-50 grams of CHO of a 2000 kcal diet is a standard keto diet [6]

**Postulated benefits of KD:**

- Limits carbohydrate intake and promotes weight loss, improves anthropometric parameters like, body weight, BMI, fat mass, waist circumference, hip-waist ratio, abdominal visceral fat (VAT), subcutaneous fat (SAT) etc
- Improves fasting blood sugar and HbA1c
- Improves HDL and triglyceride profile
- Improves epilepsy control
- May slow progress of some cancer

**Common disadvantages:**

- Keto Flu-Constipation, Dizziness, Exercise tolerance difficulties, fatigue, headache, insomnia, nausea or vomiting
- Dehydration
- Vitamin and mineral deficiency
- Kidney stone formation
- Reduced athletic performance
- Regain of weight

**Reviewing Scientific evidences:**

Case reports, observational studies, RCTs, Meta analysis of RCTs, Umbrella review of Meta analyses etc are the sources of scientific evidence.

Reviewing the above resources, we get some meta-analyses of RCTs in favor of KD, some are against the KD and some revealing mixed impressions.[7] Differences in volume and weight of these three categories can guide to an overall conclusion about KD.

**Meta analyses results in favor of Keto diet:**

Title	Journal	Year	No of RCTs	Summary
Low carbohydrate ketogenic diets reduce cardiovascular risk factor levels in obese or overweight patients with T2DM: A meta-analysis of randomized controlled trials	<b>Frontiers in nutrition</b> DOI: 10.3389/fnut.2022.1092031	2022	21	<b>Decreases:</b> FBS, HbA1C, BMI, TG <b>Increases:</b> HDL
Effects of ketogenic diet on weight loss parameters among obese or overweight patients with polycystic ovary syndrome: a systematic review and meta-analysis of randomized controlled trails	<b>Food and Nutrition research</b> DOI: https://doi.org/10.29219/fnr.v68.9835	2024	11	<b>Decreases:</b> Weight, BMI

**Meta analyses revealing mixed impressions**

Title	Journal	Year	No of RCTs	Summary
Impact of a Ketogenic Diet on Metabolic Parameters in Patients with Obesity or Overweight and with or without Type 2 Diabetes: A Meta-Analysis of Randomized Controlled Trials	<b>Nutrients</b> DOI: 10.3390/nu12072005	2020	14	<b>Reduces:</b> HbA1C, BMI, TG <b>Increases:</b> HDL <b>Other risk markers:</b> no substantial difference
Effect of Ketogenic Diet on Cancer: A Systematic Review and Meta-Analysis of Randomized Controlled Trials	<b>Journal of Surgery and Emergency medicine</b> Adeleh Khodabakhshi et al		12	<b>Reduces:</b> Weight ,BMI, FM,Blood glucose <b>Short term effect</b>
The effect of ketogenic diet on body composition and anthropometric measures: A systematic review and meta-analysis of randomized controlled trials	<b>Critical Reviews in Food Science and Nutrition</b> DOI: 10.1080/10408398.2020.1867957	2014	18	Beneficial effects on BW, BMI, FM, FFM, LBM, WC, VAT & PBF <b>Long-term effect unclear.</b>

**Table 1: Meta analyses result against keto diet**

Title	Journal	Year	No of RCTs	Summary
The effect of dietary approaches to stop hypertension and ketogenic diets intervention on serum uric acid concentration: a systematic review and meta-analysis of randomized controlled trial	<b>Scientific Reports</b> volume 13, Article number: 10492 (2023)	2023	10	<b>No effect keto diet on uric acid</b>
Effect of ketogenic diet on blood pressure: A GRADE-Assessed systematic review and meta-analysis of randomized controlled trials	<b>Nutr Metab Cardiovasc Dis</b> . 2024 Apr;34(4):823-837. doi: 10.1016/j.numecd.2023.12.004	2024	23	<b>KDs do not seem to be effective in improving BP</b>
The effects of the ketogenic diet for the management of type 2 diabetes mellitus: A systematic review and meta-analysis of recent studies	<b>Diabetes Metab Syndr</b> doi:10.1016/j.dsx.2023.102905.	2017	11	<b>No additional benefits :</b> glycaemic control, weight loss over two years
Effects of very low-carbohydrate ketogenic diets on lipid profiles in normal-weight (body mass index < 25 kg/m2) adults: a meta-analysis	<b>Nutr Rev</b> . 2023 Oct 10;81(11):1393-1401. doi: 10.1093/nutrit/nuad017.	2023	3	<b>Increases:</b> Total cholesterol, LDL-C, Apo B,HDL <b>Neutral to:</b> TG
Increased low-density lipoprotein cholesterol on a low-carbohydrate diet in adults with normal but not high body weight: A meta-analysis	<b>Am J Clin Nutr</b> doi:10.1016/j.ajcnut.2024.01.009. Epub 2024 Jan 17.	2024	41	<b>A substantial increase: LDL-C In low BMI</b>

**Table 2: Meta analyses result against keto diet**

Title	Journal	Year	No of RCTs	Summary
Effects of low-carbohydrate diets v. low-fat diets on body weight and cardiovascular risk factors: a meta-analysis of randomised controlled trials	<b>Br J Nutr</b> Nadia Mansoor et al doi:10.1017/S0007114515004699.	2016	11	greater weight loss  increased LDL-cholesterol.
Effects of low-carbohydrate vs low-fat diets on weight loss and cardiovascular risk factors: a meta-analysis of randomized controlled trials	<b>Arch Intern Med</b> Alain J Nordmann et al doi:10.1001/archinte.166.3.285.	2006	05	LCD more wt loss @ 6month <b>This difference was no longer obvious after 12 months</b>
Effectiveness of low-carbohydrate diets for long-term weight loss in obese individuals: A meta-analysis of randomized controlled trial	<b>Diabetes Metab".</b> Giovanni Antonio et al doi: 10.1111/dom.1470	2022	25	significantly greater BMI reduction at 3-4 months No difference at 10-14 and 18-30 months
Effect of Ketogenic Diet on Quality of Life in Adults with Chronic Disease: A Systematic Review of Randomized Controlled Trials	<b>Nutrients</b> Myriam et al doi:10.3390/nu13124463	2021	09	effect of KD on QOL in adults with chronic disease is inconclusive

**Table 3: Meta analyses result against keto diet**

Title	Journal	Year	No of RCTs	Summary
Ketogenic diet most effective among carbohydrate-restricted diets for short-term weight loss – meta-analysis	<b>Nutritional Ingredients Asia</b> Hui ling dang https://doi.org/10.3390/nu13.1287987	2023	110	Effective only in short term No difference in long term
Systematic review and meta-analysis of clinical trials of the effects of low carbohydrate diets on cardiovascular risk factors	<b>Obes Rev.</b> 2012 doi: 10.1111/j.1467-789X.2012.01021.x. F L Santos et al	2012	23	favourable effects on body weight & major cardiovascular risk factors. <b>however, the effects on long-term health are unknown.</b>
Very-low-carbohydrate ketogenic diet v. low-fat diet for long-term weight loss: a meta-analysis of randomised controlled trials	<b>Br J Nut</b> 2013 Oct;110(7):1178-87. doi: 10.1017/S0007114513000548. et al	2013	13	<b>Increased LDL-C</b>

**Umbrella Reviews**

Title	Journal	Year	No of RCTs	Summary
Effects of ketogenic diet on health outcomes: an umbrella review of meta-analyses of randomized clinical trials	<b>BMC Medicine</b> volume 21, Article number: 196 (2023) Chanthawat Patikorn et al	2023	17 meta analysis 68RCTs	Increases: LDL-C <b>Long term effect not known</b>
Ketogenic Diet and Multiple Health Outcomes: An Umbrella Review of Meta-Analysis	<b>Nutrients</b> 2023 Sep 27;15(19):4161. doi: 10.3390/nu15194161.	2023	23 meta analysis	Increases: LDL-C, T cholesterol HDL Reduces: seizure Testosterone

So above tables reveal that weight and volume of scientific evidence is largely against keto diet.

**Keto diet: Points in favor**

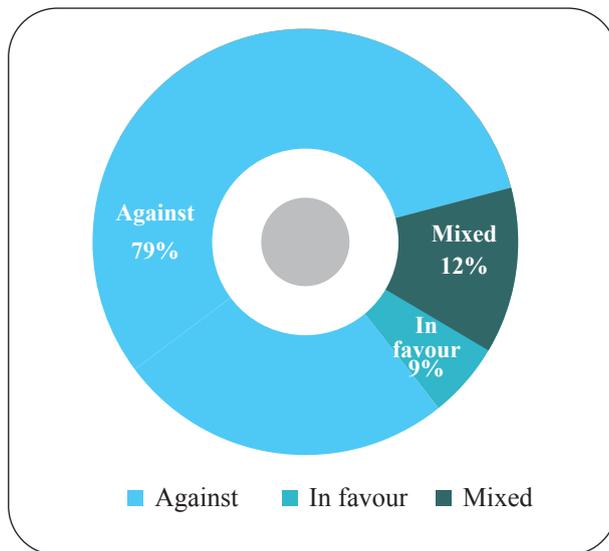
Reduces	Reduces	Reduces	Reduces	Increases
<b>BW</b>	<b>FM</b>	<b>FBS</b>	<b>TG</b>	<b>HDL</b>
<b>BMI</b>	<b>FFM</b>	<b>HbA1C</b>		
<b>LBW</b>	<b>VAT</b>			

**Keto diet: Points against**

No effect	Neutral	Inconclusive	Short term	Increases
S. Uric acid	TG	QOL	Wt reduction 3-4 months	Total Cholesterol
BP	TG	QOL	Not maintained 10-14 months	LDL-C
			Not maintained 18-30 months	ApoB

**Volume of evidence**

In favor	Mixed	Against
32 RCTS	44 RCTs	<b>284 RCTs</b>
9%	12%	<b>79%</b>



### Recommendation of developed countries:

- Uk government has published a general dietary guideline for its citizens which is known as “The Eat well Guide”. Where base meal is suggested to be made of starchy carbohydrate and minimize poly unsaturated fat. [8]
- Dietary guidelines for Americans:2020-25 recommends saturated fat less than 10% of total daily calorie requirement.[9]

### Conclusion:

Keto diet can't be a public policy. Only be practiced under relevant specialist.

### References

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