

Consultation on the draft report:

Lower carbohydrate diets for adults with type 2 diabetes

Comments Form

Organisation	N/A
Name of commentator and contact details	Shivani Parikh

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General comments	Comments
<p>Consideration needed whether the replacement for carbohydrates is plant based or animal based along with other risks for an individual (such as heart disease) as a result of switch to a low carb diet and use of known long term effects of diet – even if they are not specific to diabetes as it is important that a diet being recommended is sustainable as otherwise, it could easily be misinterpreted</p>	<p>Please insert each new comment in a new row</p> <p>I would like to raise a number of concerns when considering changing guidelines using mainly short term analysis as impacts over long term are limited as the focus is only on those having type 2 diabetes. I believe that if there are studies that suggest certain diets reduce the risk of developing type 2 diabetes, then these shouldn't be ignored.</p> <p>Also I note that Diabetes.org.uk mentions:</p> <p><i>Research suggests that the best type of diet is one that you can maintain in the long term, so it's important to talk to your healthcare professional about what you think will work for you.</i></p> <p>So as there is considerable evidence that such a low carb diet is not healthy over the long term (and I will be including some evidence below), such a diet should not be promoted for the short term as it can't be maintained over the long term and if it is, this is shown to increase the risk of early deaths.</p> <p>Also, even if there are known to be short term benefits for diabetics of such a low carb diet, giving a message that a low carb diet could be beneficial is likely to contribute to the confusion that carbs are bad and such a diet could then be advocated to say prevent diabetes and / or over the long term for those who have diabetes when studies suggest that it could have adverse impacts on mortality. My concern is that if government is sending out messages that low carb diets can be beneficial for diabetics over the short term (as it currently does), it legitimises the use of these diets not only for diabetics over the short term, but also for diabetics over the longer term and then for anyone who may want to prevent diabetes when there may be other diets which may be better for them. I understand that NHS already says this:</p> <p><i>There is evidence that low-carb diets are safe and effective in the short-term for most people with Type 2 diabetes. They help with weight-loss, diabetes control and reducing risk of complications.</i></p> <p>However, as NHS then doesn't specify the duration of the short term and any known adverse impacts of continuing such a diet over the long term and whether there are any benefits for those who don't have Type 2 diabetes, this can lead to people generally trying this diet and over the long term believing it to be a healthy diet in line with NHS guidelines.</p> <p>I also understand that there are companies that are offering such diet creating to this confusion with the Low Carb Program (as promoted by Diabetes Digital Media Ltd) and also Second Nature (as promoted by Our Path Ltd). Both of these programs focus on low carb diets only and as their apps are available on NHS Apps library, I believe it legitimises their use for purposes for which NHS does not recommend the diet.</p>

There are numerous recent studies that also consider the long term impact of low carb diets which are not specific to diabetes which suggest that the outcomes are impacted on whether plant based sources or animal based sources are considered. So I believe that when formulating advice, it is not just an issue of whether fat can replace carbohydrates but the sources of the replacement can have a significant impact on the outcome. Although such studies don't meet the criteria as they don't focus on the outcomes for diabetic patients, I believe given other long term studies don't exist, these shouldn't be ignored.

Similarly, I'm also including studies that show increased risk of cardiovascular diseases from high saturated fat intake as I believe such knowledge shouldn't be ignored as it doesn't make sense to me to consider the impact on diabetes in isolation if an individual is likely to have increased risk of other diseases that could increase mortality risk over the long term.

Study 1:

Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis Lancet Public Health 2018; 3: e419–28 Published Online August 16, 2018

Sara B Seidelmann, Brian Claggett, Susan Cheng, Mir Henglin, Amil Shah, Lyn M Steffen, Aaron R Folsom, Eric B Rimm, Walter C Willett, Scott D Solomon

Their findings (copied in part):

In the metaanalysis of all cohorts (432 179 participants), both low carbohydrate consumption (<40%) and high carbohydrate consumption (>70%) conferred greater mortality risk than did moderate intake, which was consistent with a U-shaped association (pooled hazard ratio 1·20, 95% CI 1·09–1·32 for low carbohydrate consumption; 1·23, 1·11–1·36 for high carbohydrate consumption). However, results varied by the source of macronutrients: mortality increased when carbohydrates were exchanged for animal-derived fat or protein (1·18, 1·08–1·29) and mortality decreased when the substitutions were plant-based (0·82, 0·78–0·87).

Study 2:

Contribution of the Nurses' Health Studies to Uncovering Risk Factors for Type 2 Diabetes: Diet, Lifestyle, Biomarkers, and Genetics

Sylvia H. Ley, PhD, RD, Andres V. Ardisson Korat, MS, Qi Sun, ScD, Deirdre K. Tobias, ScD, Cuilin Zhang, MD, PhD, Lu Qi, MD, PhD, Walter C. Willett, MD, DrPH, JoAnn E. Manson, MD, DrPH, and Frank B. Hu, MD, PhD

Nutrients. Although higher total fat intake was initially hypothesized to contribute to diabetes by inducing insulin resistance and promoting weight gain, the NHS did not reveal an association between total fat intake and type 2 diabetes risk. Diets that favor plant-based oils over animal fats were associated with a lower type 2 diabetes risk. Greater intake of n-6 polyunsaturated fatty acids was associated with a lower risk as well, whereas greater intake of trans fatty acids was associated with a higher risk independent of other fats. Replacing trans fatty acids or saturated fat with n-6 polyunsaturated fatty acids was related to a lower type 2 diabetes risk. A diet rich in fiber, especially fiber from cereal products, has been associated with a lower type 2 diabetes risk. Higher carbohydrate quality, evaluated via the glycemic index and glycemic load, which measure an individual's glycemic response to carbohydrate-rich foods, was associated with a lower risk independent of the amount of cereal fiber in a person's diet. Higher starch consumption, low fiber consumption, and a high starch-to-cereal-fiber ratio were associated with a higher type 2 diabetes risk.

Their conclusion (relevant part copied):

Higher consumption of coffee, whole grains, fruits, and nuts is associated with a lower type 2 diabetes risk, whereas regular consumption of refined grains, red and processed meats, and SSBs is associated with a higher risk.

Study 3:

Dietary habits contribute to define the risk of type 2 diabetes in humans.

Adeva-Andany MM¹, Rañal-Muñoz E², Vila-Altesor M², Fernández-Fernández C², Funcasta-Calderón R², Castro-Quintela E².

Clin Nutr ESPEN. 2019 Dec;34:8-17. doi: 10.1016/j.clnesp.2019.08.002. Epub 2019 Aug 30.

RESULTS:

Animal protein consumption increases the risk of T2D independently of body mass index. Intake of both unprocessed meat and processed meat is strongly and consistently associated with increased risk of developing T2D. In contrast, consumption of high-quality vegetable foods prevents the disease. High-quality plant foods include whole grains, nuts, legumes, fruits, and vegetables. Among less healthy plant-based foods are fruit juices, sweetened beverages, refined grains, potatoes, sweets, and desserts. Carbohydrate-restricted diets that encourage consumption of animal products promote T2D. Low intake of animal products is linked to high educational level so that well-informed individuals tend to consume diets with elevated content of vegetable food. According to the American Dietetic Association, "appropriately planned vegetarian diets including vegan diets are healthful, nutritionally adequate, and may provide health benefits in the prevention and treatment of certain diseases".

CONCLUSIONS:

restricting animal products while increasing healthy plant-based foods intake facilitates T2D prevention. To neutralize worldwide the burden of T2D and its devastating complications, animal products consumption should be limited or discontinued.

Study 4:**Effect of diet composition on insulin sensitivity in humans.**

Adeva-Andany MM¹, González-Lucán M², Fernández-Fernández C², Carneiro-Freire N², Seco-Filgueira M², Pedre-Piñeiro AM².

Clin Nutr ESPEN. 2019 Oct;33:29-38. doi: 10.1016/j.clnesp.2019.05.014. Epub 2019 Jun 6.

Abstract

Diet composition has a marked impact on the risk of developing type 2 diabetes and cardiovascular disease. Prospective studies show that dietary patterns with elevated amount of animal products and low quantity of vegetable food items raise the risk of these diseases. In healthy subjects, animal protein intake intensifies insulin resistance whereas plant-based foods enhance insulin sensitivity. Similar effects have been documented in patients with diabetes. Accordingly, pre-pregnancy intake of meat (processed and unprocessed) has been strongly associated with a higher risk of gestational diabetes whereas greater pre-pregnancy vegetable protein consumption is associated with a lower risk of gestational diabetes. Population groups that modify their traditional dietary habit increasing the amount of animal products while reducing plant-based foods experience a remarkable rise in the frequency of type 2 diabetes. The association of animal protein intake with insulin resistance is independent of body mass index. In obese individuals that consume high animal protein diets, insulin sensitivity does not improve following weight loss. Diets aimed to lose weight that encourage restriction of carbohydrates and elevated consumption of animal protein intensify insulin resistance increasing the risk of developing type 2 diabetes and cardiovascular disease. The effect of dietary components on insulin sensitivity may contribute to explain the striking impact of eating habits on the risk of type 2 diabetes and cardiovascular disease. Insulin resistance predisposes to type 2 diabetes in healthy subjects and deteriorates metabolic control in patients with diabetes. In nondiabetic and diabetic individuals, insulin resistance is a major cardiovascular risk factor.

Study 5:**A plant-based diet for the prevention and treatment of type 2 diabetes**

Michelle McMacken and Sapana Shah

[J Geriatr Cardiol](#). 2017 May; 14(5): 342–354. PMCID: PMC5466941 PMID: [28630614](#)

There is a general consensus that the elements of a whole-foods plant-based diet—legumes, whole grains, fruits, vegetables, and nuts, with limited or no intake of refined foods and animal products—are highly beneficial for preventing and treating type 2 diabetes. Equally important, plant-based diets address the bigger picture for patients with diabetes by simultaneously treating cardiovascular disease, the leading cause of death in the United States, and its risk factors such as obesity, hypertension, hyper-lipidemia, and inflammation. The advantages of a plant-based diet also extend to reduction in risk of cancer, the second leading cause of death in the United States; the World Cancer Research Fund and the American Institute for Cancer Research recommend eating mostly foods of plant origin, avoiding all processed meats and sugary drinks, and limiting intake of red meats, energy dense foods, salt, and alcohol for cancer prevention.^[149] Large healthcare organizations such as Kaiser Permanente are promoting plant-based diets for all of their patients because it is a cost effective, low-risk intervention that treats numerous chronic illnesses simultaneously and is seen as an important tool to address the rising cost of health care.^[147] Plant-based eating patterns also carry significant environmental benefits. The World Health Organization and the United Nations have promoted diets higher in plant foods as not only effective for preventing chronic diseases and obesity, but also more environmentally sustainable than diets rich in animal products,^[150] a position also supported in the scientific report of the 2015 United States Dietary Guidelines Advisory Committee.^[151] While larger interventional studies on plant-based diets carried out for longer periods of time would add even more weight to the already mounting evidence, the case for using a plant-based diet to reduce the burden of diabetes and improve overall health has never been stronger.

Study 6:

Vegetarian Diets and the Risk of Diabetes

[Melissa D. Olfert](#) and [Rachel A. Wattick](#) [Curr Diab Rep](#). 2018; 18(11): 101.
Published online 2018 Sep 18. PMCID: PMC6153574 PMID: [30229314](#)

Conclusion

The benefits of all types of vegetarian diets in the prevention and treatment of diabetes have been well established. Clinicians and healthcare providers should feel confident in recommending a vegetarian diet to their patients who have pre-diabetes or T2DM. However, the type of foods that should be consumed while following this diet is critical to achieve the therapeutic effects. As Satija et al. demonstrated, a vegetarian diet that is high in unhealthy foods such as refined grains, saturated fats, and added sugars is positively associated with T2DM compared to a vegetarian diet with lower amounts of these nutrients. The foods that are important to

consume while following a vegetarian diet for treating diabetes are whole grains, fruits, vegetables, nuts, legumes, and unsaturated fats. Each of these foods has functional components that reduce the symptoms of diabetes. For these reasons, clinician knowledge and patient education is extremely important to ensure the adherence to a healthy vegetarian diet. No matter the type of vegetarian diet followed, there are therapeutic effects. However, there is evidence that a vegan diet has the most benefits for reducing the fasting plasma glucose levels of persons with diabetes and other complications, such as CVD risk. Patients should follow the diet that they feel they can adhere to best.

Future research is needed to examine intervention trials adopting different variations of a vegetarian diet to further assess which type, combination, or degree is most beneficial. Intervention trials should incorporate long-term follow-up to measure adherence of different types of vegetarian diets, as this is important for patient recommendations.

Study 7:

Meat and fish intake and type 2 diabetes: dose-response meta-analysis of prospective cohort studies.
Diabetes Metab. 2020 Apr 14. pii: S1262-3636(20)30055-0. doi: 10.1016/j.diabet.2020.03.004.

CONCLUSION:

Our meta-analysis has shown a linear dose-response relationship between total meat, red meat and processed meat intakes and T2D risk. In addition, a non-linear relationship of intake of processed meat with risk of T2D was detected.

Study 8:

Dietary Protein Consumption and the Risk of Type 2 Diabetes: A Dose-Response Meta-Analysis of Prospective Studies.

Nutrients. 2019 Nov 15;11(11). pii: E2783. doi: 10.3390/nu11112783.

Abstract

The relationship between dietary protein consumption and the risk of type 2 diabetes (T2D) has been inconsistent. The aim of this meta-analysis was to explore the relations between dietary protein consumption and the risk of T2D. We conducted systematic retrieval of prospective studies in PubMed, Embase, and Web of Science. Summary relative risks were compiled with a fixed effects model or a random effects model, and a restricted cubic spline regression model and generalized least squares analysis were used to evaluate the diet-T2D incidence relationship. T2D risk increased with increasing consumption of total protein and animal protein, red meat, processed meat, milk, and eggs, respectively, while plant protein and yogurt had an inverse

relationship. A non-linear association with the risk for T2D was found for the consumption of plant protein, processed meat, milk, yogurt, and soy. This meta-analysis suggests that substitution of plant protein and yogurt for animal protein, especially red meat and processed meat, can reduce the risk for T2D.

Study 9:

Food groups and risk of type 2 diabetes mellitus: a systematic review and meta-analysis of prospective studies

[Eur J Epidemiol](#). 2017; 32(5): 363–375. Published online 2017 Apr 10. PMID: 28397016

Conclusion

Among the investigated food groups, selecting specific optimal intakes (by increasing whole grains, vegetables, fruits, and dairy; and reducing red and processed meats, SSB, and eggs) can lead to a considerable change in risk of T2D.

Study 10:

Although the study below relates to risk of coronary heart disease, I'm including this below as it is noted in Saturated fats and health, SACN report 2019:

Often, CVD and type 2 diabetes co-exist as they share common modifiable risk factors, such as obesity, and in particular elevated central adiposity. Type 2 diabetes has a strong association with obesity, and body weight control is a key factor in the prevention of progression from impaired glycaemic control to incident type 2 diabetes (Pi-Sunyer et al, 2007; American Diabetes Association and National Institute of Diabetes Digestive and Kidney Diseases, 2002).

Saturated Fats Compared With Unsaturated Fats and Sources of Carbohydrates in Relation to Risk of Coronary Heart Disease: A Prospective Cohort Study.

[Li Y^{#1}](#), [Hruby A^{#1}](#), [Bernstein AM²](#), [Ley SH¹](#), [Wang DD¹](#), [Chiuve SE^{1,3}](#), [Sampson L¹](#), [Rexrode KM³](#), [Rimm EB^{1,4,5}](#), [Willett WC^{1,4,5}](#), [Hu FB^{1,4,5}](#).

J Am Coll Cardiol. 2015 Oct 6;66(14):1538-1548. doi: 10.1016/j.jacc.2015.07.055.

CONCLUSIONS:

Our findings indicate that unsaturated fats, especially PUFAs, and/or high-quality carbohydrates can be used to replace saturated fats to reduce CHD risk.

Study 11:

I'm mentioning this although it is not specific to diabetes as mentioned above, body weight control is a key factor in the prevention of progression from impaired glycaemic control to incident type 2 diabetes

Can dietary viscous fiber affect body weight independently of an energy-restrictive diet? A systematic review and meta-analysis of randomized controlled trials

The American Journal of Clinical Nutrition, Volume 111, Issue 2, February 2020, Pages 471–485

Conclusions

Dietary viscous fiber modestly yet significantly improved body weight and other parameters of adiposity independently of calorie restriction. Future trials are warranted to address the inconsistency and imprecision identified through GRADE and to determine long-term weight-loss sustainability.

Study 12:

I'm capturing this below as it relates to all cause mortality (though doesn't specifically consider diabetes). After all, even if low carb diets can help with diabetes management in the short term, if this means missing out on beneficial quantities of fruit & veg, then this could lead to other adverse consequences which need to be considered.

Fruit and vegetable intake and the risk of cardiovascular disease, total cancer and all-cause mortality—a systematic review and dose-response meta-analysis of prospective studies

International Journal of Epidemiology, Volume 46, Issue 3, June 2017, Pages 1029–1056,

Conclusions: Fruit and vegetable intakes were associated with reduced risk of cardiovascular disease, cancer and all-cause mortality. These results support public health recommendations to increase fruit and vegetable intake for the prevention of cardiovascular disease, cancer, and premature mortality.

Study 13:

Association of Specific Dietary Fats With Total and Cause-Specific Mortality

Dong D. Wang, MD, MSc^{1,3}; Yanping Li, PhD¹; Stephanie E. Chiuve, ScD^{1,2}; et al

- **Question** What are the long-term associations between dietary intake of specific fats and mortality?
- **Findings** In this cohort study that included 126 233 participants followed up for as long as 32 years, higher intakes of saturated fat and *trans*-fat were associated with increased mortality, whereas higher intakes of polyunsaturated (PUFA) and monounsaturated (MUFA) fatty acids were associated with lower mortality. Replacing 5% of energy from saturated fats with equivalent energy from PUFA and MUFA was associated with reductions in total mortality of 27% and 13%, respectively.

Study 14:

Vegetarian and vegan diets in type 2 diabetes management

Neal D Barnard, Heather I Katcher, David JA Jenkins, Joshua Cohen, and Gabrielle Turner-McGrievy

Vegetarian and vegan diets offer significant benefits for diabetes management. In observational studies, individuals following vegetarian diets are about half as likely to develop diabetes, compared with non-vegetarians. In clinical trials in individuals with type 2 diabetes, low-fat vegan diets improve glycemic control to a greater extent than conventional diabetes diets. Although this effect is primarily attributable to greater weight loss, evidence also suggests that reduced intake of saturated fats and high-glycemic-index foods, increased intake of dietary fiber and vegetable protein, reduced intramyocellular lipid concentrations, and decreased iron stores mediate the influence of plant-based diets on glycemia. Vegetarian and vegan diets also improve plasma lipid concentrations and have been shown to reverse atherosclerosis progression. In clinical studies, the reported acceptability of vegetarian and vegan diets is comparable to other therapeutic regimens. The presently available literature indicates that vegetarian and vegan diets present potential advantages for the management of type 2 diabetes.

Study 15:**Usefulness of vegetarian and vegan diets for treating type 2 diabetes.**

Trapp CB¹, Barnard ND.

Abstract

Significant benefits for diabetes prevention and management have been observed with vegetarian and especially vegan diets. This article reviews observational studies and intervention trials on such diets, and discusses their efficacy, nutritional adequacy, acceptability, and sustainability. Research to date has demonstrated that a low-fat, plant-based nutritional approach improves control of weight, glycemia, and cardiovascular risk. These studies have also shown that carefully planned vegan diets can be more nutritious than diets based on more conventional diet guidelines, with an acceptability that is comparable with that of other therapeutic regimens. Current intervention guidelines from professional organizations offer support for this approach. Vegetarian and vegan diets present potential advantages in managing type 2 diabetes that merit the attention of individuals with diabetes and their caregivers.

Study 16:**Carbohydrate and Fiber Recommendations for Individuals with Diabetes: A Quantitative Assessment and Meta-Analysis of the Evidence****Abstract**

To review international nutrition recommendations with a special emphasis on carbohydrate and fiber, analyze clinical trial information, and provide an evidence-based recommendation for medical nutrition therapy for individuals with diabetes. Relevant articles were identified by a thorough review of the literature and the data tabulated. Fixed-effects meta-analyses techniques were used to obtain mean estimates of changes in outcome measures in response to diet interventions. Most international organizations recommend that diabetic individuals achieve and maintain a desirable body weight with a body mass index of $\leq 25 \text{ kg/m}^2$. For diabetic subjects moderate carbohydrate, high fiber diets compared to moderate carbohydrate, low fiber diets are associated with significantly lower values for: postprandial plasma glucose, total and low-density lipoprotein cholesterol, high-density lipoprotein cholesterol, and triglycerides. High carbohydrate, high fiber diets compared to moderate carbohydrate, low fiber diets are associated with lower values for: fasting, postprandial and average plasma glucose; hemoglobin A_{1c}; total, LDL-cholesterol, HDL-cholesterol and triglycerides. Low glycemic index diets compared to high glycemic index diets are associated with lower fasting plasma glucose values and lower glycosylated protein values. Based on these analyses we recommend that the diabetic individual

should be encouraged to achieve and maintain a desirable body weight and that the diet should provide these percentages of nutrients: carbohydrate, $\geq 55\%$; protein, 12–16%; fat, $< 30\%$; and monounsaturated fat, 12–15%. The diet should provide 25–50 g/day of dietary fiber (15–25 g/1000 kcal). Glycemic index information should be incorporated into exchanges and teaching material.

Study 17:

Association of Animal and Plant Protein Intake With All-Cause and Cause-Specific Mortality in a Japanese Cohort.

JAMA Intern Med. 2019 Nov 1;179(11):1509-1518. doi: 10.1001/jamainternmed.2019.2806.

CONCLUSIONS AND RELEVANCE:

In this large prospective study, higher plant protein intake was associated with lower total and CVD-related mortality. Although animal protein intake was not associated with mortality outcomes, replacement of red meat protein or processed meat protein with plant protein was associated with lower total, cancer-related, and CVD-related mortality.

Study 18:

Changes in red meat consumption and subsequent risk of type 2 diabetes mellitus: three cohorts of US men and women.

Pan A¹, Sun Q, Bernstein AM, Manson JE, Willett WC, Hu FB.

CONCLUSIONS AND RELEVANCE:

Increasing red meat consumption over time is associated with an elevated subsequent risk of T2DM, and the association is partly mediated by body weight. Our results add further evidence that limiting red meat consumption over time confers benefits for T2DM prevention.

Study 19:

Whole Grain Intake and Mortality From All Causes, Cardiovascular Disease, and Cancer

A Meta-Analysis of Prospective Cohort Studies

Geng Zong, Alisa Gao, Frank B. Hu and Qi Sun

Originally published 14 Jun 2016

Our meta-analysis demonstrated inverse associations of WG intake with total and cause-specific mortality, and findings were particularly strong and robust for CVD mortality. These findings further support current Dietary Guidelines for Americans, which recommends at least 3 servings per day of WG intake.

Study 20:

High red and processed meat consumption is associated with non-alcoholic fatty liver disease and insulin resistance.

Zelber-Sagi S¹, Ivancovsky-Wajcman D², Fliss Isakov N³, Webb M⁴, Orenstein D², Shibolet O⁴, Kariv R⁴.

CONCLUSION:

High consumption of red and/or processed meat is associated with both NAFLD and IR. High HCA intake is associated with IR. If confirmed in prospective studies, limiting the consumption of unhealthy meat types and improving preparation methods may be considered as part of NAFLD lifestyle treatment.

Study 21:

Potential health hazards of eating red meat

J Intern Med. 2017 Feb;281(2):106-122. doi: 10.1111/joim.12543. Epub 2016 Sep 6.

Here, a comprehensive summary is provided of the accumulated evidence based on prospective cohort studies regarding the potential adverse health effects of red meat consumption on major chronic diseases, such as diabetes, coronary heart disease, heart failure, stroke and cancer at several sites, and mortality. Risk estimates from pooled analyses and meta-analyses are presented together with recently published findings.

Based on at least six cohorts, summary results for the consumption of unprocessed red meat of 100 g day⁻¹ varied from nonsignificant to statistically significantly increased risk (11% for stroke and for breast cancer, 15% for cardiovascular mortality, 17% for colorectal and 19% for advanced prostate cancer); for the consumption of 50 g day⁻¹ processed meat, the risks were statistically significantly increased for most of the studied diseases (4% for total prostate cancer, 8% for cancer mortality, 9% for breast, 18% for colorectal and 19% for pancreatic cancer, 13% for stroke, 22% for total and 24% for cardiovascular mortality and 32% for diabetes). Potential biological mechanisms underlying the observed risks and the environmental impact of red meat production are also discussed. The evidence-based integrated message is that it is plausible to conclude that high consumption of red meat, and especially processed meat, is associated with an increased risk of several major chronic diseases and preterm mortality. Production of red meat involves an environmental burden. Therefore, some European countries have already integrated these two issues, human health and the 'health of the planet', into new dietary guidelines and recommended limiting consumption of red meat.

Study 22:

Below is a short term study but it is for over 3 months though it includes adults with no history of diabetes but it relates to diabetes marker.

A Plant-Based Dietary Intervention Improves Beta-Cell Function and Insulin Resistance in Overweight Adults: A 16-Week Randomized Clinical Trial

In conclusion, we have demonstrated that beta-cell function and fasting insulin sensitivity can be modified by a 16-week dietary intervention. Our study suggests the potential of a low-fat plant-based diet in diabetes prevention, addressing both core pathophysiologic mechanisms—insulin resistance and diminished beta-cell function—at the same time.

Study 23:

Intake of individual saturated fatty acids and risk of coronary heart disease in US men and women: two prospective longitudinal cohort studies

Conclusions Higher dietary intakes of major SFAs are associated with an increased risk of coronary heart disease. Owing to similar associations and high correlations among individual SFAs, dietary recommendations for the prevention of coronary heart disease should continue to focus on replacing total saturated fat with more healthy sources of energy.

Study 24:

	<p>Although this is just a case study, it highlights one of the many risks of following such a diet even for those who don't have type 2 diabetes.</p> <p>Ketoacidosis associated with low-carbohydrate diet in a non-diabetic lactating woman: a case report</p> <p style="text-align: center;">Conclusions</p> <p>Ketogenic diets like low carbohydrate, high fat may induce ketoacidosis. Lactation might further aggravate the condition and can perhaps even be the trigger into ketoacidosis. Health services should be aware of the risks associated with ketogenic diets, and be able to recognize this serious condition when it is presented.</p>
Another study – which may meet the criteria specified	<p>A Low-Fat Vegan Diet Improves Glycemic Control and Cardiovascular Risk Factors in a Randomized Clinical Trial in Individuals With Type 2 Diabetes</p> <p>Barnard ND¹, Cohen J, Jenkins DJ, Turner-McGrievy G, Gloede L, Jaster B, Seidl K, Green AA, Talpers S.</p> <p>In conclusion, in individuals with type 2 diabetes participating in a 22-week clinical trial, both a low-fat vegan diet and a diet following ADA guidelines improved glycemic control; however, the changes were greater in the vegan group. Further research is necessary to establish longer-term diet effects and sustainability.</p>
Another study – which may meet the criteria specified	<p>A low-fat vegan diet and a conventional diabetes diet in the treatment of type 2 diabetes: a randomized, controlled, 74-wk clinical trial.</p> <p>Barnard ND¹, Cohen J, Jenkins DJ, Turner-McGrievy G, Gloede L, Green A, Ferdowsian H.</p> <p>CONCLUSIONS:</p> <p>Both diets were associated with sustained reductions in weight and plasma lipid concentrations. In an analysis controlling for medication changes, a low-fat vegan diet appeared to improve glycemia and plasma lipids more than did conventional diabetes diet recommendations. Whether the observed differences provide clinical benefit for the macro- or microvascular complications of diabetes remains to be established.</p>
Another study – which may meet the criteria specified	<p>Vegetarian diets and glycemic control in diabetes: a systematic review and meta-analysis</p> <p>Yoko Yokoyama,¹ Neal D. Barnard,^{2,3} Susan M. Levin,³ and Mitsuhiro Watanabe^{4,5}</p>

	<p>Cardiovasc Diagn Ther. 2014 Oct; 4(5): 373–382. PMCID: PMC4221319 PMID: 25414824</p> <p>Conclusions</p> <p>Consumption of vegetarian diets is associated with improved glycemic control in type 2 diabetes.</p>
Another study – which may meet the criteria specified	<p>Dietary patterns and management of type 2 diabetes: A systematic review of randomised clinical trials.</p> <p>Papamichou D¹, Panagiotakos DB², Itsiopoulos C¹.</p> <p>CONCLUSIONS:</p> <p>Although more long-term intervention trials are required, mounting evidence supports the view that vegan, vegetarian and Mediterranean dietary patterns should be implemented in public health strategies, in order to better control glycemic markers in individuals with T2DM.</p>

Comments by paragraph	Comments
	Please insert each new comment in a new row
Table A2.1: Details of literature search	This could have included vegetarian, vegan and plant based diets as these are generally high carb diets which are low in fat and some of them would have comparisons with conventional diets which are higher in fat intake which would allow for some comparisons – I've included many such studies above.

Please add extra rows as needed