

## Glycemic index, glycemic load, and chronic disease risk

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### FROM ABSTRACT

#### Background:

Inconsistent findings from observational studies have prolonged the controversy over the effects of dietary glycemic index (GI) and glycemic load (GL) on the risk of certain chronic diseases.

#### Objective:

The objective was to evaluate the association between GI, GL, and chronic disease risk with the use of meta-analysis techniques.

#### Design:

A systematic review of published reports identified a total of 37 prospective cohort studies of GI and GL and chronic disease risk.

#### Results:

From 4 to 20 years of follow-up studies, a total of 40,129 incident cases were identified. For the comparison between the highest and lowest quantiles of GI and GL, significant positive associations were found in fully adjusted models of validated studies for:

	<b>Glycemic Index (GI)</b>	<b>Glycemic Load (GL)</b>
<b>Type 2 diabetes</b>	40%	27%
<b>Coronary heart disease</b>	25%	NA
<b>Breast cancer</b>	8%	NA
<b>Gallbladder disease</b>	26%	42%
<b>All diseases combined</b>	14%	9%

#### Conclusions:

Low-GI and/or low-GL diets are independently associated with a reduced risk of certain chronic diseases.

The findings support the hypothesis that higher postprandial glycemia is a universal mechanism for disease progression.

## THESE AUTHORS ALSO NOTE:

“Worldwide, chronic diseases such as diabetes, cardiovascular disease, stroke, and cancer contribute to 60% of all deaths, and the proportion is predicted to increase to 75% by the year 2020.”

“Increases in refined sugar intake have been accompanied by more subtle changes in starchy foods, eg, processed cereal products have replaced more traditionally processed grains.”

“Because carbohydrate is the main dietary component affecting insulin secretion and postprandial glycemia, it is implicated in the etiology of many chronic diseases.”

In 1981, the concept of the glycemic index (GI) was introduced to quantify the glycemic response to carbohydrates in different foods.

“Glycemic load (GL), the mathematical product of the GI of a food and its carbohydrate content, has been proposed as a global indicator of the glucose response and insulin demand induced by a serving of food.”

## RESULTS

The association between GI and GL and the increased risk of developing specific diseases

	<b>Glycemic Index (GI)</b>	<b>Glycemic Load (GL)</b>
<b>Type 2 diabetes</b>	40%	27%
<b>Heart disease</b>	25%	57%
<b>Stroke</b>	2%	28%
<b>All cardiovascular diseases</b>	NA	41%
<b>Breast cancer</b>	9%	NA
<b>Colorectal cancer</b>	11%	11%
<b>Endometrial cancer</b>	13%	72%
<b>All cancers</b>	8%	NA
<b>Gallbladder disease</b>	26%	42%
<b>Eye disease</b>	10%	NA
<b>All diseases combined</b>	14%	9%

“When all of the studies were analyzed, there were significant positive associations between GI or GL and relative risks for type 2 diabetes, heart disease, colorectal cancer, endometrial cancer, gallbladder disease, and all diseases combined.”

“In an analysis stratified by the 2 major chronic disease groups, cancer and cardiovascular disease, there were significant positive associations between GI and risk of all cancers and between GL and risk of all cardiovascular diseases.”

## DISCUSSION

In a meta-analysis of 37 prospective observational studies, we found that diets with a high GI or GL independently increased the risk of these diseases:

Type 2 diabetes	GI	40%	GL	27%
Heart disease	GI	25%	GL	57%
Gallbladder disease	GI	26%	GL	41%
Breast cancer	GI	8%	GL	NA
All diseases combined	GI	14%	GL	9%

“There were more positive associations of greater magnitude between GI and chronic disease than between GL and chronic disease.”

“Our findings support the hypothesis that postprandial hyperglycemia, in individuals without diabetes, contributes to chronic disease.”

“Higher glucose concentrations are thought to play a direct pathogenic role in the disease process.”

Other studies have linked increased glucose levels to a variety of diseases, including:

- 1) All-cause mortality
- 2) Cardiovascular disease
- 3) Cancer risk
- 4) Colorectal cancer
- 5) Pancreatic cancer

There are plausible mechanisms linking the development of certain chronic diseases with high-GI diets, specifically:

- 1) The same amount of carbohydrates from high-GI foods produces higher blood glucose concentrations and a greater demand for insulin. The chronically increased insulin demand may eventually result in pancreatic beta cell failure, and, as a consequence, impaired glucose tolerance.
- 2) High glucose and insulin concentrations are associated with increased risk profiles for cardiovascular disease.

3) The mitogenic action of insulin-like growth factors suggests a role in the etiology of various cancers. Insulin stimulates a rise in insulin-like growth factors.

“Diets with a high GI, high GL, or both, independently of known confounders, including fiber intake, increase the risk of chronic lifestyle-related diseases.”

“Irrespective of the level of carbohydrate intake, the GI of contributing carbohydrate foods is important.”

“The findings indicate that the judicious choice of low-GI foods offers a similar or higher level of protection as whole-grain foods or high fiber intake in the prevention of chronic lifestyle-related disease.”

#### KEY POINTS FROM DAN MURPHY

GI = glycemic index

GL = glycemic load

1) “Low-GI and/or low-GL diets are independently associated with a reduced risk of certain chronic diseases.”

2) “Higher postprandial glycemia is a universal mechanism for disease progression.”

3) “Worldwide, chronic diseases such as diabetes, cardiovascular disease, stroke, and cancer contribute to 60% of all deaths, and the proportion is predicted to increase to 75% by the year 2020.”

4) “Increases in refined sugar intake have been accompanied by more subtle changes in starchy foods, eg, processed cereal products have replaced more traditionally processed grains.”

5) “Because carbohydrate is the main dietary component affecting insulin secretion and postprandial glycemia, it is implicated in the etiology of many chronic diseases.”

6) In 1981, the concept of the glycemic index (GI) was introduced to quantify the glycemic response to carbohydrates in different foods.

7) “Glycemic load (GL), the mathematical product of the GI of a food and its carbohydrate content, has been proposed as a global indicator of the glucose response and insulin demand induced by a serving of food.”

8) “When all of the studies were analyzed, there were significant positive associations between GI or GL and relative risks for type 2 diabetes, heart disease, colorectal cancer, endometrial cancer, gallbladder disease, and all diseases combined.”

- 9) "In an analysis stratified by the 2 major chronic disease groups, cancer and cardiovascular disease, there were significant positive associations between GI and risk of all cancers and between GL and risk of all cardiovascular diseases."
- 10) "Our findings support the hypothesis that postprandial hyperglycemia, in individuals without diabetes, contributes to chronic disease."
- 11) "Higher glucose concentrations are thought to play a direct pathogenic role in the disease process."
- 12) Studies have linked increased glucose levels to a variety of diseases:
- A)) All-cause mortality
  - B)) Cardiovascular disease
  - C)) Cancer risk
  - D)) Colorectal cancer
  - D)) Pancreatic cancer
- 13) "Diets with a high GI, high GL, or both, independently of known confounders, including fiber intake, increase the risk of chronic lifestyle-related diseases."
- 14) "Irrespective of the level of carbohydrate intake, the GI of contributing carbohydrate foods is important."
- 15) "The findings indicate that the judicious choice of low-GI foods offers a similar or higher level of protection as whole-grain foods or high fiber intake in the prevention of chronic lifestyle-related disease."