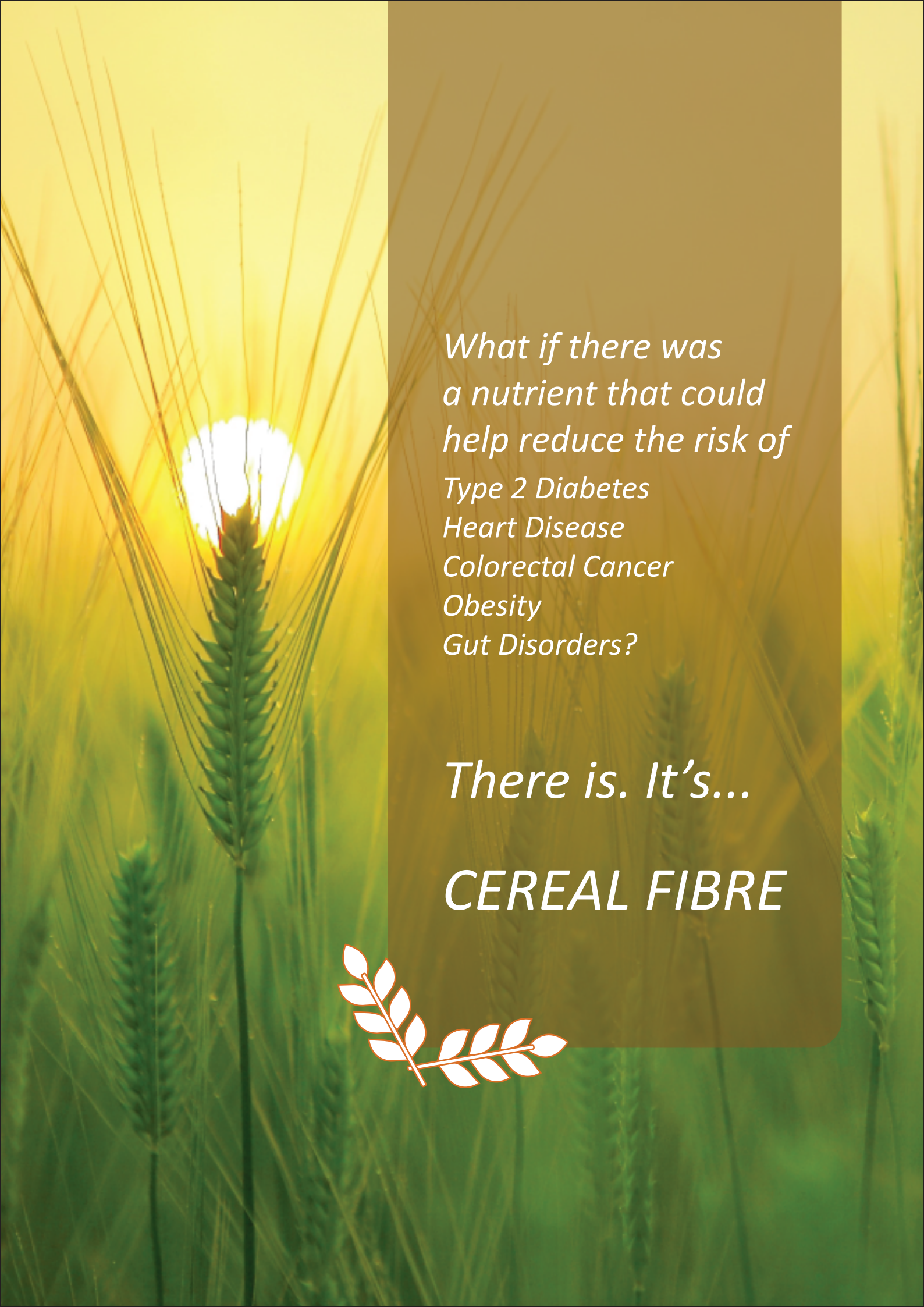

What if there was
a nutrient that could
help reduce the risk of
Type 2 Diabetes
Heart Disease
Colorectal Cancer
Obesity
Gut Disorders?
There is. It's...
CEREAL FIBRE

Why Cereal Fibre?

The importance of dietary fibre is well recognized. There is consistent evidence from systematic reviews and meta-analysis of cohort studies that dietary modifications that increase fibre intake play an important role in reducing the risk for chronic diseases such as Type 2 Diabetes (T2D), Cardio-Vascular Diseases (CVD), cancer, diverticular disease and weight gain.

Yet, emerging evidence now suggests that the type of fibre ingested should be of greater relevance to health care professionals than total fibre intake *per se*. And, based on totality of scientific evidence, dietary fibre from grain (cereal) foods seems to be particularly important for chronic disease risk reduction.[1]

Fibre & Mortality

In a large prospective National Institute of Health (NIH) – AARP Diet and Health Study of 3,67,442 participants followed over a period of 14 years, it was seen that in multivariate models, as compared to individuals with lowest intake of whole grains, those with highest intakes had 17% lower risk of all-cause mortality and 11 to 48% lower risk of disease specific mortality.

Similarly, as compared to individuals with the lowest intake of cereal fibre, those with highest intakes had a 19% lower risk of all-cause mortality and 15-34% lower risk of death from CVD, cancer, T2D, respiratory disease and infections (Figure 1). The data suggests that the protective effects of whole grain may be attributable mainly to the cereal fibre content.[2]

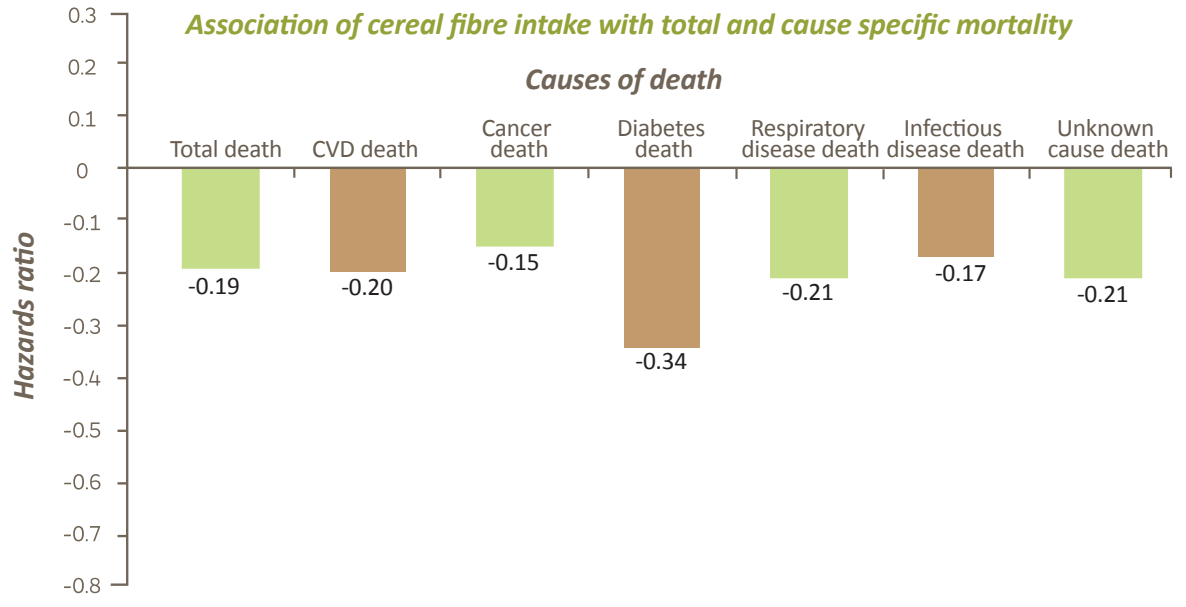


Figure 1: Hazards ratio for total and cause specific mortality in multivariate adjusted models for the highest vs lowest quintile of cereal fibre intake. (*P < 0.023)

Adapted from: Huang et al. 2015[2]

A recent systematic review and meta-analysis of prospective studies and randomized controlled trials from database inception to 2017/2018 commissioned by WHO (World Health Organization) has shown that higher intakes of dietary fibre or whole grains are associated with a reduction in risk of mortality and incidence of a wide range of non-communicable diseases (NCDs) including coronary heart disease (CHD), T2D and colorectal and breast cancer, and their risk factors (body weight, blood pressure and cholesterol). The similar protective effects of higher intakes of whole grain and of dietary fibre suggest that the beneficial effects of whole grain could be because of their cereal fibre content.[3]

However, it is important to recognize that besides cereal fibre, the whole cereal grain contains myriads of bioactive plant compounds that offer immense health benefits.[4] Among RTEC (ready-to-eat cereal) consumers in the NIH-AARP Diet and Health Study, it was seen that highest vs. lowest intake of fibre rich RTEC resulted in a 15% lower risk of all-cause mortality and 10-30% lower risk of disease specific mortality.[5]

Interestingly of all fibre sources, it is cereal fibre that demonstrates the greatest risk reduction

- Reduced risk of all-cause mortality by 19%
- Reduced risk of CVD mortality by 20%
- Reduced risk of Cancer mortality by 15%
- Reduced risk of Diabetes mortality by 34%

"Dietary fibre from grains, but not from other sources, was significantly and inversely related to total and cause-specific death in both men and women".[6]

Cereal Fibre & Diabetes

Diabetes is a serious and increasing public health burden globally. India is identified as the world's capital of diabetes. The diabetic population in the country is likely to hit the alarming mark of 69.9 million by 2025 and 80 million by 2030.[7] Since primary prevention is the key, what evidence-based recommendations should we be making to reduce the risk of developing it?

Cereal Fibre Reduces Diabetes Risk

The European EPIC (European Prospective Investigation into Cancer and nutrition)– Inter Act study showed that after adjusting for lifestyle and dietary factors, a high intake of total fibre compared with a low intake was associated with an 18% lower risk of incident T2D.

The risk reduction was driven by cereal and vegetable fibre and not by fruit fibre. A more recent meta-analysis of prospective studies carried out by the same authors, supports an inverse association between total fibre and cereal fibre intake and risk of T2D (9% and 25% lower RR per 10g intake/day respectively) which was independent of body mass index (BMI).[8]

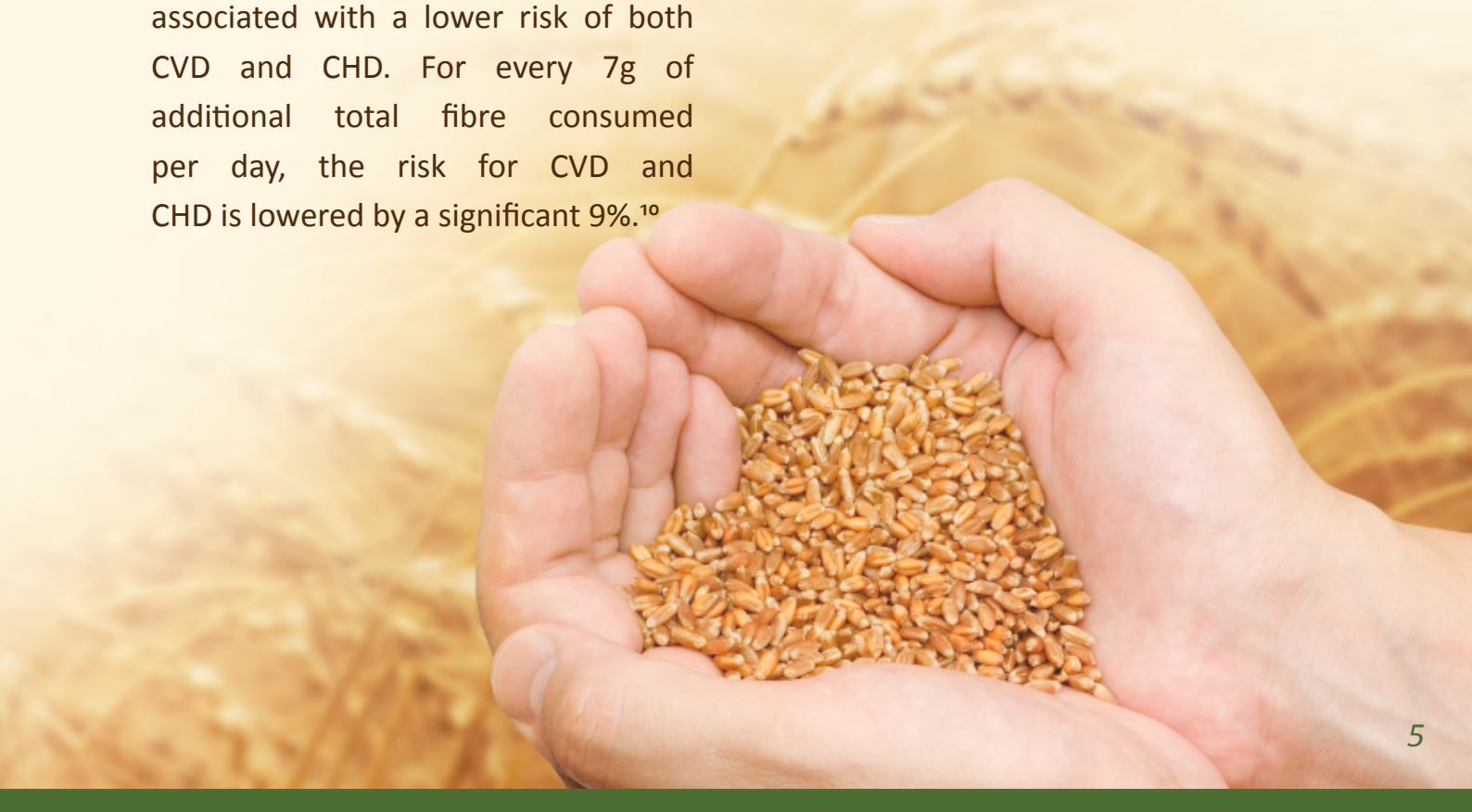
An umbrella review of all published (1980-2017) meta-analysis comparing subjects with the highest vs lowest levels of fibre intake, found a statistically significant reduction of 15-19% in the incidence of T2D. The reduction was maximum and significant (13-33%) only with intake of cereal fibre and not vegetable or fruit fibre.[9]

"People with Diabetes should be encouraged to increase their dietary intakes of foods that are rich in fibre such as high fibre cereals".[9]

Cereal Fibre & Heart Disease

Heart disease and its risk factors such as hypertension, central obesity, insulin sensitivity and elevated plasma cholesterol have always been at the fore-front when it comes to studying diet-disease relationship. Data from literature published over the last two decades indicates that greater dietary fibre intake, specifically from cereal or vegetable sources are significantly associated with a lower risk of both CVD and CHD. For every 7g of additional total fibre consumed per day, the risk for CVD and CHD is lowered by a significant 9%.[10]

In prospective data on diet and lifestyle collected from women and men participating in the NHS (Nurses Health Study) and HPFS (Health Professionals Follow-up Study) respectively, it was seen that even after adjusting for all potential confounding variables, cereal fibre was consistently and significantly associated with a reduced risk of CHD in both men and women (Figure 2).



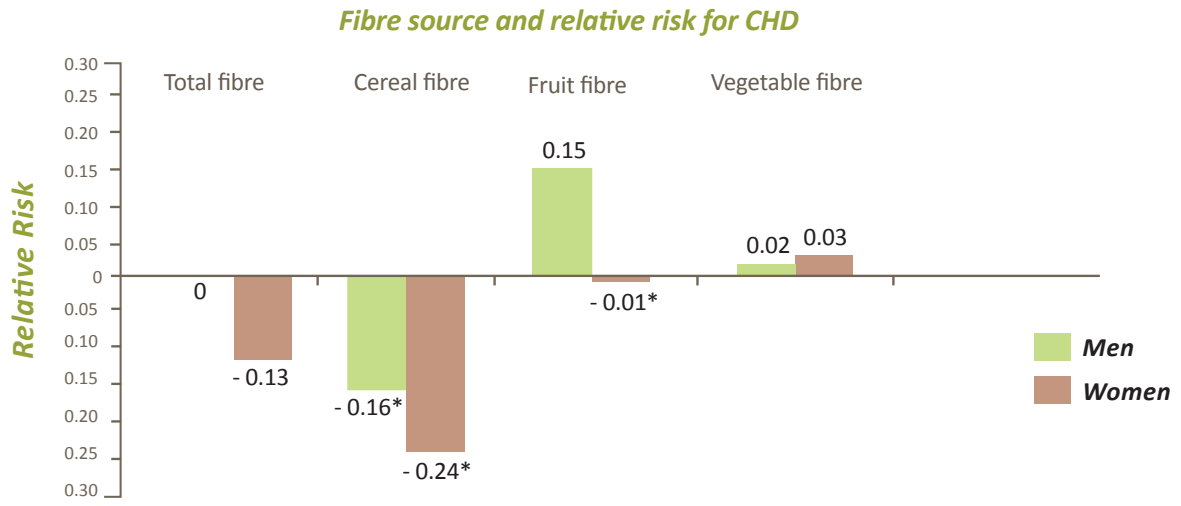


Figure 2: Relative risk of CHD for highest vs. lowest quintile intakes of total fibre and fibre from cereal, fruit and vegetable among men and women (*P < 0.02)

Adapted from: Alessa et al, 2018.[11]

Fruit and vegetable fibre, however, were not associated with a significant reduction in risk for heart disease. Further the carbohydrate: cereal fibre ratio and the starch: cereal fibre ratio but not the carbohydrate: fibre ratio was associated with a 20% and 17% increased risk respectively for incident CHD. Thus, the cereal fibre content appears to be the chief determinant of carbohydrate quality and the major driving force for reduction of risk from heart disease.[11]

A cross-sectional study based on NHNES (National Health and Nutrition Examination Survey) data indicates that intakes of total, cereal and vegetable fibre, but not fruit fibre is associated with a decreased risk of hypertension in US adults.[12]

Cereal Fibre & Colorectal Cancer

There is enough evidence to suggest that a high dietary fibre intake protects against CRC (colorectal cancer). Fibre minimizes exposure to intestinal carcinogens by diluting faecal content and by reducing intestinal transit time. Also, fermentation of dietary fibre by gut bacteria produces SCFA (Short Chain Fatty Acids) with anti-carcinogenic properties.[13,14] A large prospective study showed that elevated dietary fibre intakes reduced the risk for incident colorectal adenoma. In fully adjusted models, highest vs lowest tertile intakes of total fibre resulted in 24% lower risk for incident colorectal adenoma. The protective effect seen with total fibre was also seen with increased intakes of cereal fibre but not fibre from fruits or vegetables. Highest intakes of cereal fibre resulted in a 22% lower risk for incident colorectal adenoma, compared to lowest intakes (Figure 3).

"Only cereal fibre and not fibre from fruits or vegetables reduces the risk for incident colorectal adenoma".[14]

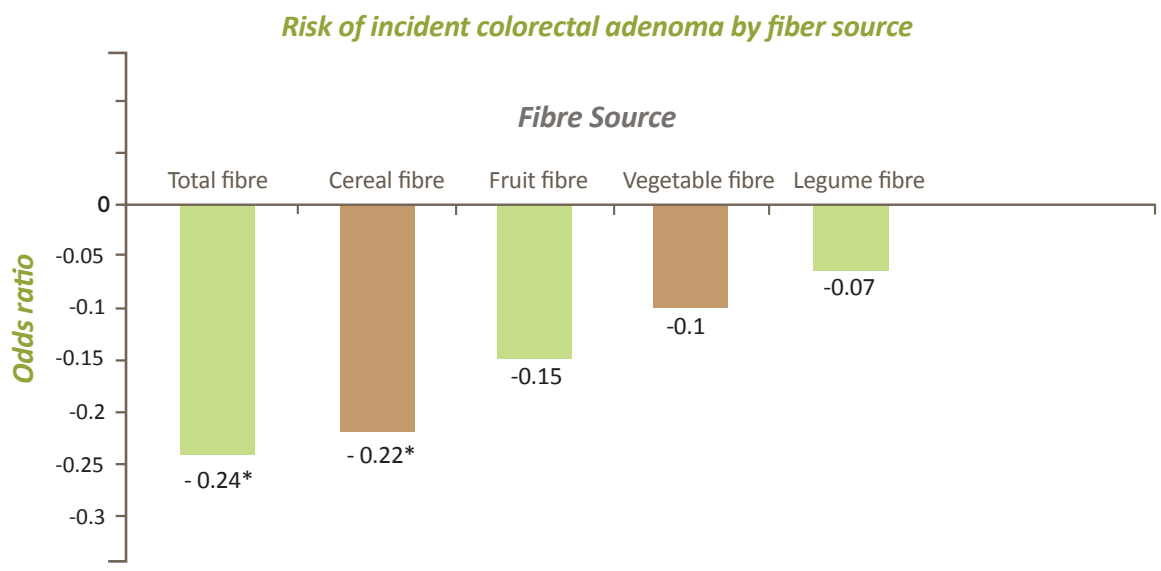


Figure 3: OR values in adjusted models for highest versus lowest tertiles of intake of total fibre and fibre from cereal, vegetables, fruits and legumes. (*P < 0.006)

Adapted from: Kunzmann et al, 2015.[14]

A recent study also suggests that dietary fibre may help colon cancer survivors live longer. Eating fibre rich foods was associated with a 15-20% lower risk of mortality from colon cancer or any other cause. High fibre cereals and whole grains have the greatest impact on improving survival followed by fibre-rich vegetables and the fruits.[13]

Cereal Fibre & Weight Management

Obesity is a world-wide pandemic that carries with it the additional burden of multiple and serious co-morbidities including metabolic syndrome, type 2 diabetes and cardiovascular diseases. Clinical trials demonstrate that moderate weight loss of 5-10% improves obesity and associated cardio metabolic risk factors. Increasing dietary fibre could be one of the important nutritional strategiesto modify, induce and maintain weight loss.[15]

Prospective studies consistently find that people consuming fibre dense diets are leaner than those consuming lower fibre diets. Randomized trials also show that fibre rich whole food diets promote weight loss and reduce risk of weight gain in overweight and obese subjects.[16]

Multiple regression analysis of NHNES (National Health and Nutrition Examination Survey)

Higher intakes of dietary fibre or cereal fibre are associated with lower body weight, BMI (Body Mass Index), waist circumference and percentage body fat)

2001-2012 data shows an inverse association between whole grain intake and BMI, waist circumference and weight gain in adults and children after adjustment of co-variates. Subjects who consumed wholegrain (≥ 1oz eq/day) had significantly better intakes of dietary fibre (18.4g vs 11.9g in children and 22g vs 13.7g in adults) compared to non-consumers.[17] Dietary fibre acts through different pathophysiological mechanisms involving different sites of action in the gastro intestinal tract (Figure 4).[15]

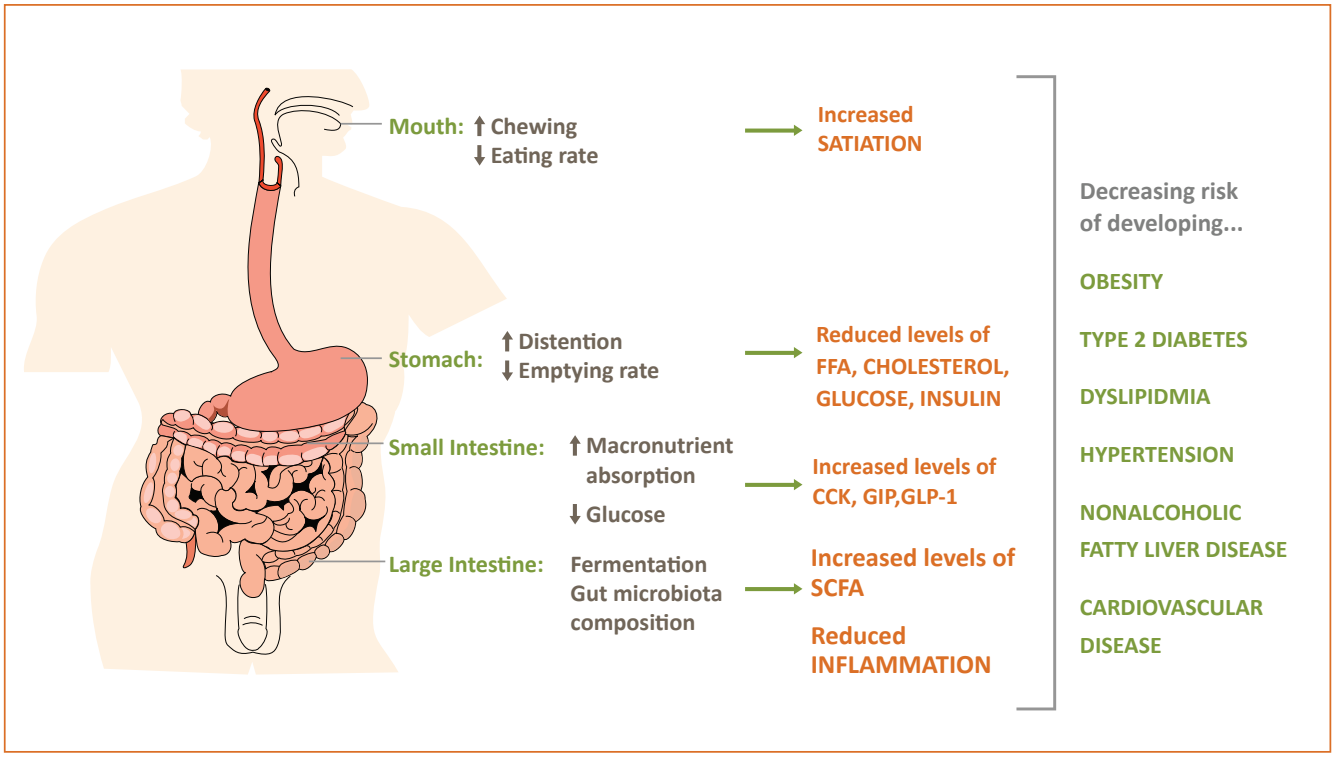


Figure 4: Plausible mechanisms of action whereby fibre may influence body weight and its related common chronic diseases. CCK: cholecystokinin; GIP: gastric inhibitory peptide; GLP-1: glucagon like peptide 1; SCFA: short chain fatty acids.

Adapted from Bozzetto et al, 2018.[15]

Cereal Fibre & Digestive Disorders

Faecal weight and transit time are key indicators of bowel function. Dietary fibre has been advocated for improving intestinal and digestive health since early 1970s. Insoluble and less fermentable fibres, particularly cereal fibre and bran, promote regularity, increase stool weight and speed transit time.[18]

Wheat Bran: The Best Fibre For Promoting Regularity

Regularity promotion (as assessed by increase in fecal weight/g of fibre)

Among 41 interventions that examined wheat fibre - which

Wheat bran is considered as the "gold standard" when it comes to faecal bulking and promoting regularity since no other fibre or laxative has been shown to be as effective.[19] *The effect of wheat bran on increasing faecal bulk is greater than other grains such as oats or vegetables and fruits.*[20]

European Food Safety Authority (EFSA) has an approved health claim on wheat bran which states – "Wheat bran fibre contributes to an increase in faecal bulk and reduction in intestinal transit time".[21]

consisted largely of wheat bran - the mean increase in fecal weight per g/d of wheat fibre was 5.4 g. The mean increases in fecal weight per g/d of other sources of fibre were smaller in magnitude: fruit and vegetables (4.7g), gums and mucilages (3.7 g), cellulose (3.5 g), oats (3.4 g), corn (3.3 g), legumes (2.2 g), and pectin (1.2 g) (Figure 5).

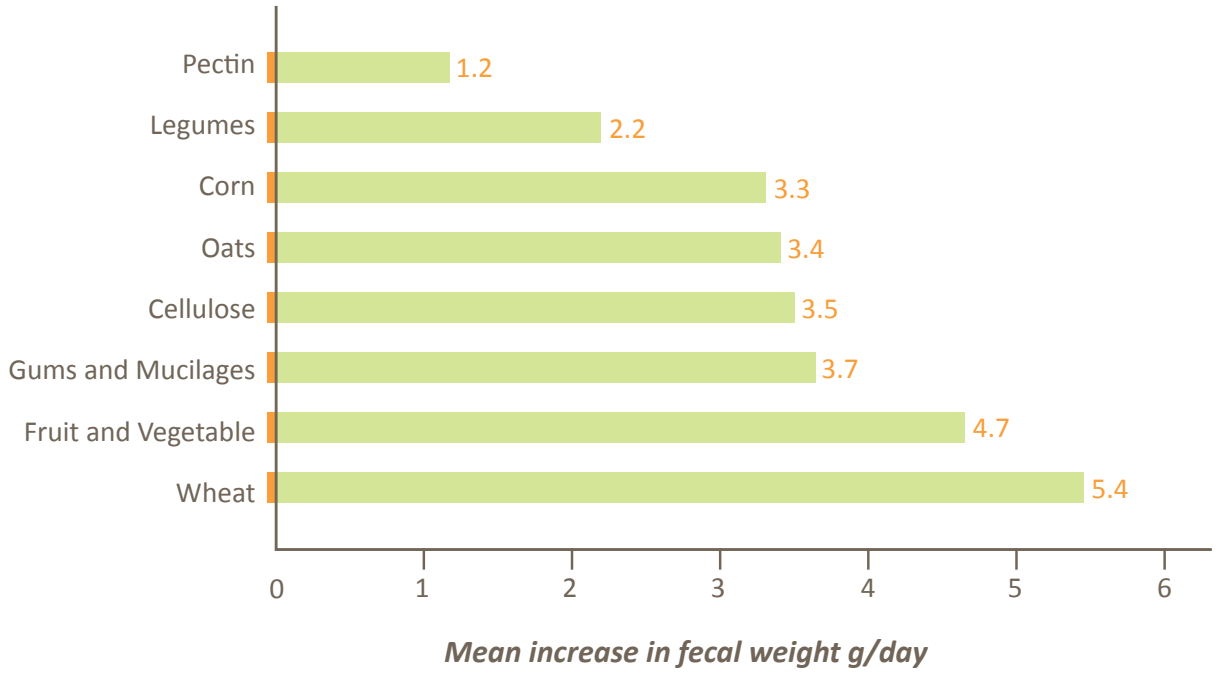


Figure 5: Regularity promotion (as assessed by increase in fecal weight/g of fibre)
Adapted from: de Vries et al, 2015.[22]

Lawson C, et al. found significant improvements in digestive health, digestive comfort and general psychological well-being in habitual low fibre consumers during the 2 week intervention period. The study participants were fed one bowl of ready-to-eat breakfast cereal containing at least 5.4 g fibre (of which 70% is wheat bran fibre) for 2 weeks duration. The physiological mechanism of action for the effect of wheat bran fibre on stool bulking and frequency is well-recognised, and relates to water absorption, the inability to digest cellulose and wheat bran morphology. However, the mechanism of action for the secondary benefits to psychological wellbeing, reported in the study, has not been established adequately.[23]

Fibre & Whole Grain Recommendations

The daily intake of total dietary fibre for Indian adults as suggested by the Indian Council of Medical Research (ICMR)[24] is 40 g/2000 kcals or 12-14 g/1000 kcals energy (NIN, 2011).

WHO/FAO and EFSA recommend 25 g/d with their recommendations based on amounts needed for healthy laxation.[25]

According to the 2015-2020 U.S guidelines, the recommended amount of grains in a 2000 kcal diet is 6 oz equivalents (1 oz equivalent is 16 g) and at least one half of this amount must be in the form of whole grain (USDA). Adequate total daily fibre intake for different age/gender groups is summarized in Figure 6.

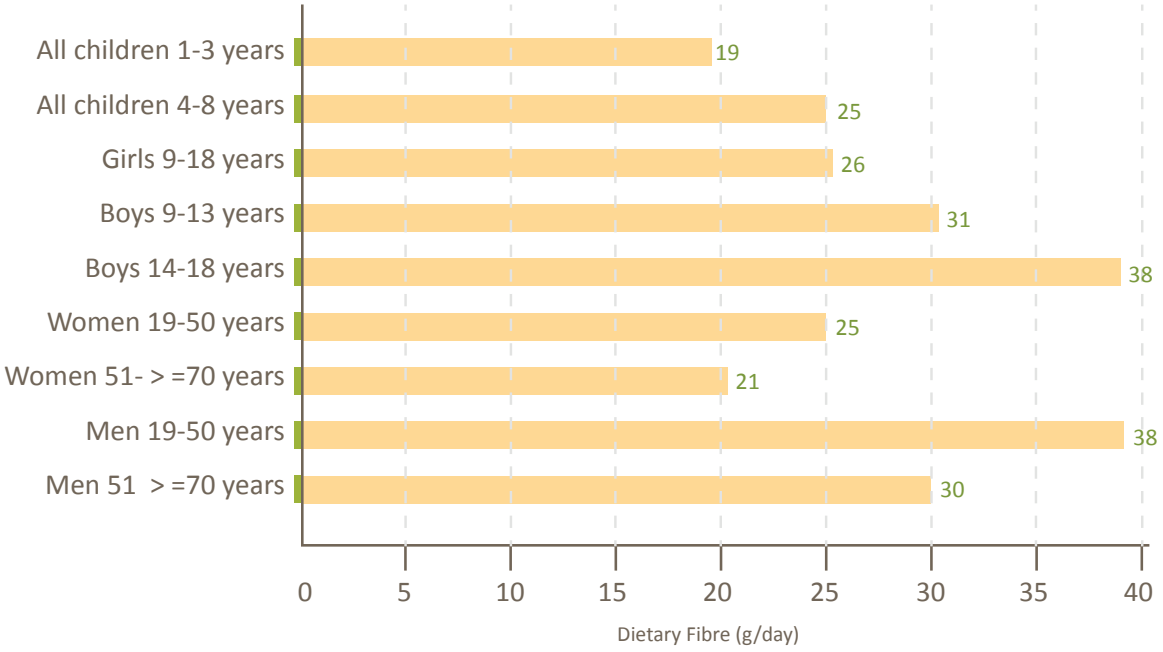


Figure 6: Recommended daily dietary fibre intake by age and gender
Adapted from: Dreher et al, 2018.[26]

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