I J R S S I S, Special Issue (V) Oct. 2025: 70-76
A Double-Blind Peer Reviewed Journal
OPEN ACCESS
e-ISSN 2347 – 517X
Original Article

INTERNATIONAL JOURNAL OF RESEARCHES IN SOCIAL SCIENCE AND INFORMATION STUDIES
 www.ijrssis.in

INCREASE CONSUMPTION OF WHOLE GRAIN

Pradnya Bagalkote
Dharampeth M.P.Deo Memorial Science College, Nagpur
*Corresponding Author: shymalipink@gmail.com

Communicated : 23.08.2025	Revision : 07.09.2025 Accepted : 25.09.2025	Published: 15.10.2025

ABSTRACT:

Whole grains and millets offer a "complete package" of health benefits, unlike refined grains, which are stripped of valuable nutrients in the refining process. Grains are the seeds of grasses grown for food. In particular, observational studies suggest that a diet rich in whole grain foods reduces the risks of type 2 diabetes and cardiovascular diseases and has a beneficial impact on body weight and mortality (reducing risk of non-communicable diseases). Researchers studying the relationship between carbohydrates and health are discovering that the quality of the carbohydrates one consumes matters just as much as their quantity. The majority of research, indicates that whole grains are linked to improved health. Therefore, in order to encourage whole grain consumption, the government must implement suitable intervention strategies, such as the creation of industry regulations and supportive policies, the execution of successful nutrition educational campaigns about healthy eating habits, and the completion of thorough research throughout the industry chain. As a sustainable alternative to refined grains, increasing consumption of whole grain has a potentially important role in ensuring food security and reducing carbon emissions.

Keywords: *Whole grains, Health, Food security, Carbon emissions, Eating habits, Phytochemicals.*

INTRODUCTION :

Historically, grains have played a significant role in human diets and were mostly eaten whole until the first half of the 1800s, when a confluence of market forces and technological advancements made refined grains—previously considered a luxury good—affordable and accessible to the general public. Whole grains and millets offer a "complete package" of health benefits which are stripped of valuable nutrients in the refining process. Grains are the seeds of grasses grown for food. These plants also are called cereals. Millets are nutrient-dense, millets differ from other major cereals like rice and wheat in that they are characterised by their high carbohydrate content and small, grassy grains. Examples of grains include wheat, bajra, jawar and rice etc. Each grain, also called a kernel, is made of three parts: Each section houses health-promoting nutrients.

Bran - Bran is the hard outer coating of a kernel. It has most of the kernel's fiber. It also has vitamins and minerals.

Germ -The germ is the part that sprouts into a new plant. It has many vitamins, healthy fats and other natural plant nutrients. The bran is the fiber-rich outer layer that supplies B vitamins, iron, copper, zinc, magnesium, antioxidants, and phytochemicals. Phytochemicals are natural chemical compounds in plants that have been researched for their role in disease prevention. **Endosperm** -The endosperm is the energy supply for the seed. It mostly contains starches. It has small amounts of proteins and vitamins. The endosperm has very little fiber. The endosperm is the interior layer that holds carbohydrates, protein, and small amounts of some B vitamins and minerals.

Benefits of whole-grain foods

Whole grain consumption has been shown to reduce the risk of several non-communicable diseases, such as cardiovascular diseases, type 2 diabetes and some types of cancer (Aune *et al.*, 2016, Chansonet *et al.,* 2015). In particular, observational studies suggest that a diet rich in

whole grain foods reduces the risks of type 2 diabetes (de munter *et al.*,2007, Ye *et al.*,2012, Tieri *et al.*, 2020) and cardiovascular diseases (Ye *et al.*,2012, Mellen *et al.*,2008,–Tang *et al.*, 2015), and has a beneficial impact on body weight (Koh *et al.*,2004) and mortality (Jacob *et al.*,2015). Several countries, including the US, Australia, and Spain, already include whole grain recommendations in their dietary guidelines for infants and young children (Klerks *et al.,* 2019). A twofold burden of malnutrition resulted from the shift in diet from whole to processed grains.

Whole Grains and Disease

As researchers have begun to look more closely at carbohydrates and health, they are learning that the quality of the carbohydrates you eat is at least as important as the quantity. Most studies, including some from several different Harvard teams, show a connection between whole grains and better health (Wu *et al.*,2015).A report from the Iowa Women's Health Study linked whole grain consumption with fewer deaths from inflammatory and infectious causes, excluding cardiac and cancer causes. Examples are rheumatoid arthritis, gout, asthma, ulcerative colitis, Crohn's disease, and neurodegenerative diseases. Compared with women who rarely or never ate whole-grain foods, those who had at least two or more servings a day were 30% less likely to have died from an inflammation-related condition over a 17-year period (Jacob *et al.*,2007).A meta-analysis combining results from studies conducted in the U.S., the United Kingdom, and Scandinavian countries (which included health information from over 786,000 individuals), found that people who ate 70 grams/day of whole grains—compared with those who ate little or no whole grains—had a 22% lower risk of total mortality, a 23% lower risk of cardiovascular disease mortality, and a 20% lower risk of cancer mortality (Zong *et al.*,2016).

Cardiovascular Diseases

Eating whole instead of refined grains substantially lowers total cholesterol, low-density cholesterol, triglycerides, and insulin levels. In the Harvard-based Nurses' Health Study, women who ate 2 to 3 servings of whole-grain products each day were 30% less likely to have a heart attack or die from heart disease over a 10-year period than women who ate less than 1 serving per week (Liu *et al.*,1999).A meta-analysis of seven major studies showed that cardiovascular diseases was 21% less likely in people who ate 2.5 or more servings of whole-grain foods a day compared with those who ate less than 2 servings a week (Mellen *et al.*,2008). Conversely, the largest global prospective cohort study to date on associations between diets and health outcomes found high intake of refined grains to be associated with higher risk of mortality and major cardiovascular disease events (Swaminathan *et al.*, 2021).

Type 2 Diabetes

Replacing refined grains with whole grains and eating at least 2 servings of whole grains daily may help to reduce type 2 diabetes risk. The fiber, nutrients, and phytochemicals in whole grains may improve insulin sensitivity and glucose metabolism and slow the absorption of food, preventing blood sugar spikes. In contrast, refined grains tend to have a high glycemic index and glycemic load with less fiber and nutrients (Aune *et al.*,2013). In a study of more than 160,000 women whose health and dietary habits were followed for up to 18 years, those who averaged 2 to 3 servings of whole grains a day were 30% less likely to have developed type 2 diabetes than those who rarely ate whole grains. Researcher found that eating an extra 2 servings of whole grains a day decreased the risk of type 2 diabetes by 21% (de munter *et al.*,2007). A follow-up study including men and women from the Nurses Health Studies I and II and the Health Professionals researcher found that

swapping white rice for whole grains could help lower diabetes risk. Those who ate white rice—five or more servings a week—had a 17% higher risk of diabetes than those who ate white rice. Those who ate brown rice—two or more servings a week—had an 11% lower risk of diabetes than those who rarely ate brown rice. Researchers estimate that swapping whole grains in place of even some white rice could lower diabetes risk by 36% (Sun *et al.*,2010). A large study of more than 72,000 postmenopausal women without diabetes at the start of the study found that the higher the intake of whole grains, the greater the risk reduction of type 2 diabetes. A 43% reduced risk was found in women eating the highest amount of whole grains (2 or more servings daily) as compared with those who ate no whole grains (Parker *et al.*,2013).

Cancer

The data on cancer are mixed, with some studies showing a protective effect of whole grains and others showing none (Aune *et al.*,2013,Jacob *et al.*,1998). A large five-year study among nearly 500,000 men and women suggests that eating whole grains, but not dietary fiber, offers modest protection against colorectal cancer (Schatzkin *et al.*,2007, Strayer *et al.*,2007).A review of four large population studies also showed a protective effect of whole grains from colorectal cancer, with a cumulative risk reduction of 21% (Aune *et al.,* 2011). Inadequate whole grain consumption, which is recognized as the primary dietary factor, associated with an increased risk of colorectal cancer (Yang *et al.* 2020).

Digestive Health

By keeping the stool soft and bulky, the fiber in whole grains helps prevent constipation, a common, costly, and aggravating problem. It also helps prevent diverticular disease (diverticulosis) by decreasing pressure in the intestines and helps to generate healthy microflora (Strate *et al.*, 2017). A study of 170,776 women followed for more than 26 years looked at the effect of different dietary fibers, including that from whole grains, on Crohn's disease and ulcerative colitis. Though a reduced risk of Crohn's disease was found in those eating high intakes of fruit fiber (Ananthakrishnan *et al.*,2013). Some grains contain the naturally-occurring protein, gluten. While gluten can cause side effects in certain individuals, such as those with celiac disease, most people can and have eaten gluten most of their lives—without any adverse reaction. Whole grain products have a high nutritional quality, as they are rich in dietary fibres, minerals, and vitamins (Slavin *et al.*,2004). Moreover, whole grain products can help to reduce overweight, as they prolong digestive processes, which leads to longer feelings of satiety (Sanders *et al.,* 2021). Young adults especially show low rates of whole grain product and dietary fibre intake (Max Rubner-Institute, 2008; Sette *et al.,* 2017). Therefore, especially for this consumer segment effective strategies to increase whole grain consumption behaviour (WGCB) are needed.

Furthermore, grains when eaten with fruits and vegetables, the special phytochemicals included in whole grains enhance their effects. The presence of the distinct phytochemicals found in whole grains contributes to the positive effects linked to their ingestion. The bran fraction contains most of the health-promoting compounds found in whole grains. 83% of the total phenolic content, 79% of the total flavonoid content, 78% of the total zeaxanthin, 51% of the total lutein, and 42% of the total β-cryptoxanthin were all derived from the bran fraction of whole wheat flour. Therefore, when included in a diet, the bran percentage of whole wheat may offer more health advantages and lower the chance of developing chronic illnesses. Research recommends phytochemicals and antioxidant activity of whole grains and their unique contribution to the health.

How to increase your intake of whole grains

To increase the amount of whole grains in your meals and snacks, try these suggestions:

a. Savour breakfasts that consist of whole-grain cereals, millets and sprouted pulses. Add fresh cooked cereals.

b. Instead of using ordinary bagels, use whole-wheat roti, bhakari, toast or whole-grain bagels. Replace pastries with whole-grain, low-fat muffins.

c. Use whole-grain or multigrain breads or rolls to make sandwiches.

d. Instead of using white flour tortillas, use whole-wheat tortillas.

e. Brown rice, wild rice, bulgur, barley, or other grains can be substituted for white rice.

f. Add barley or wild rice to salads, casseroles, stews, and soups.

Both ecological viability and human health are negatively impacted by excessive use of refined grains. Making the transition from refined to fortified whole grain meals can allow institutional channels, like school feeding programs, to cost-neutrally and measurably enhance diet quality in nations with severe micronutrient shortages, to combat anaemia and malnutrition. By offering dietary fibre, B vitamins, and bioactive compounds, whole grains can improve personal health as a sustainable and healthful substitute for refined grains. They also contribute to environmental improvement because of their faster extraction rate and lower processing-stage carbon emissions. The economic and social advantages of increasing the consumption of whole grains have not, however, been thoroughly examined in many studies. An increasing amount of research has shown that increasing the consumption of whole grains is sustainable and nutritious in both national and international contexts. In addition to being higher in dietary fibre than refined grains, whole grains are also a great source of B vitamins and other bioactive compounds that are hard to get in other foods. Through gastrointestinal digestion and metabolites fermented by intestinal bacteria, these nutrients can also positively impact the management of illnesses. They can influence intestinal flora, blood glucose, blood lipids, and inflammatory response (Liu *et al.* 2022). According to earlier research, eating a healthy diet rich in whole grains may help lower the burden of disease.

There has been little study on how consuming more whole grains can save healthcare expenses. These research conclusions indicated that even a minor shift in consumer habits to consume more whole grains can result in significant cost savings for public health care. As a sustainable alternative to refined grains, increasing consumption of whole grain has a potentially important role in ensuring food security and reducing carbon emissions. (Espinoza-Orias *et al.* 2011; Tan *et al.* 2021).Despite attempts to calculate the economic advantages of switching to a higher percentage of whole grains in grain consumption, the analysis usually did not account for the environmental and nutritional effects of whole grain intake. Examining the transformation's economic feasibility for the overall food system and the allocation of financial gains among the many stakeholders is essential to better support government decisions about whole grain production and consumption. Advocating for dietary modifications and encouraging the consumption of whole grains is still difficult, though, as it is in many other nations. Traditional Indian cooking has long made extensive use of whole grains. Therefore, in order to encourage whole grain consumption, the government must implement suitable intervention strategies, such as the creation of industry regulations and supportive policies, the execution of successful nutrition educational campaigns about healthy eating habits, and the completion of thorough research throughout the industry chain.

REFERENCES :

Aune, D., Keum, N., Giovannucci, E., Fadnes, L. T., Boffetta, P., Greenwood, D. C., Tonstad, S., Vatten, L. J., Riboli, E., & Norat, T. (2016). Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. BMJ (Clinical research ed.), 353, i2716. https://doi.org/10.1136/bmj.i2716

Chanson-Rolle, A., Meynier, A., Aubin, F., Lappi, J., Poutanen, K., Vinoy, S., & Braesco, V. (2015). Systematic Review and Meta-Analysis of Human Studies to Support a Quantitative Recommendation for Whole Grain Intake in Relation to Type 2 Diabetes. PloS one, 10(6), e0131377. https://doi.org/10.1371/journal.pone.0131377

de Munter, J. S., Hu, F. B., Spiegelman, D., Franz, M., & van Dam, R. M. (2007). Whole grain, bran, and germ intake and risk of type 2 diabetes: a prospective cohort study and systematic review. PLoS medicine, 4(8), e261. https://doi.org/10.1371/journal.pmed.0040261

Ye, E. Q., Chacko, S. A., Chou, E. L., Kugizaki, M., & Liu, S. (2012). Greater whole-grain intake is associated with lower risk of type 2 diabetes, cardiovascular disease, and weight gain. The Journal of nutrition, 142(7), 1304–1313. https://doi.org/10.3945/jn.111.155325

Tieri, Ghelfi, Vitale, Vetrani, Marventano , Lafranconi, A., (2020). Whole grain consumption and human health: an umbrella review of observational studies. International journal of food sciences and nutrition, 71(6), 668–677. https://doi.org/10.1080/09637486.2020.1715354

Mellen PB, Walsh TF, Herrington DM(2008). Whole grain intake and cardiovascular disease: a meta-analysis. Nutrition, metabolism, and cardiovascular diseases: NMCD.;18(4):283–90.

Tang, G., Wang, D., Long, J., Yang, F., & Si, L. (2015). Meta-analysis of the association between whole grain intake and coronary heart disease risk. The American journal of cardiology, 115(5), 625–629. https://doi.org/10.1016/j.amjcard.2014.12.015

Koh-Banerjee P, Franz M, Sampson L, Liu S, Jacobs DR Jr., Spiegelman D, et al(2004). Changes in whole-grain, bran, and cereal fiber consumption in relation to 8-y weight gain among men. The American journal of clinical nutrition. 80(5):1237–45

Jacobs DR Jr., Andersen LF, Blomhoff R. Whole-grain consumption is associated with a reduced risk of non-cardiovascular, noncancer death attributed to inflammatory diseases in the Iowa Women's Health Study. The American journal of clinical nutrition. 2007;85(6):1606–14.

Klerks, M., Bernal, M. J., Roman, S., Bodenstab, S., Gil, A., & Sanchez-Siles, L. M. (2019). Infant Cereals: Current Status, Challenges, and Future Opportunities for Whole Grains. Nutrients, 11(2), 473. https://doi.org/10.3390/nu11020473

Wu H, Flint AJ, Qi Q, et al (2015). Association between dietary whole grain intake and risk of mortality: two large prospective studies in US men and women. JAMA Intern Med.175:373-84.

Jacobs DR, Jr., Andersen LF, Blomhoff R (2007). Whole-grain consumption is associated

with a reduced risk of noncardiovascular, noncancer death attributed to inflammatory diseases in the Iowa Women's Health Study. Am J Clin Nutr.;85:1606-14.

Zong G, Gao A, Hu FB, Sun Q (2016). Whole Grain Intake and Mortality From All Causes, Cardiovascular Disease, and Cancer: A Meta-Analysis of Prospective Cohort Studies. Circulation. 133:2370-80.

Liu S, Stampfer MJ, Hu FB, et al(1999). Whole-grain consumption and risk of coronary heart disease: results from the Nurses' Health Study. Am J Clin Nutr.;70:412-9.

Swaminathan, S., Dehghan, M., Raj, J. M., Thomas, T., Rangarajan, S., Jenkins, D.,(2021). Associations of cereal grains intake with cardiovascular disease and mortality across 21 countries in Prospective Urban and Rural Epidemiology study: prospective cohort study. BMJ (Clinical research ed.), 372, m4948. https://doi.org/10.1136/bmj.m4948

Aune D, Norat T, Romundstad P, Vatten LJ (2013). Whole grain and refined grain consumption and the risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies. Eur J Epidemiol.28:845-58.

Sun Q, Spiegelman D, van Dam RM, et al(2010). White rice, brown rice, and risk of type 2 diabetes in US men and women. Arch Intern Med. 170:961-9.

Parker ED, Liu S, Van Horn L, et al(2013). The association of whole grain consumption with incident type 2 diabetes: the Women's Health Initiative Observational Study. Ann Epidemiol. 23:321-7.

Aune D, Keum N, Giovannucci E, et al(2016). Whole grain consumption and risk of cardiovascular disease, cancer, and all cause and cause specific mortality: systematic review and dose-response meta-analysis of prospective studies. BMJ. 353:i2716.

Jacobs DR, Jr., Marquart L, Slavin J, Kushi LH(1998). Whole-grain intake and cancer: an expanded review and meta-analysis. Nutr Cancer.30:85-96.

Schatzkin A, Mouw T, Park Y, et al(2007). Dietary fiber and whole-grain consumption in relation to colorectal cancer in the NIH-AARP Diet and Health Study. Am J Clin Nutr. 85:1353-60.

Strayer , Jacobs , Jr., Schairer , Schatzkin , Flood (2007). Dietary carbohydrate, glycemic index, and glycemic load and the risk of colorectal cancer in the BCDDP cohort. Cancer Causes Control. 18:853-63.

Aune, Chan , Lau , et al (2011). Dietary fibre, whole grains, and risk of colorectal cancer: systematic review and dose-response meta-analysis of prospective studies. BMJ. 343:d6617.

Yang, Han, Li, Huang, J Shi, Gu(2020).Epidemiology and risk factors of colorectal cancer in China,Chinese Journal of Cancer Research, 32,729-741

Strate , Keeley , Cao , Wu , Giovannucci , Chan (2017). Western Dietary Pattern Increases, and Prudent Dietary Pattern Decreases, Risk of Incident Diverticulitis in a Prospective Cohort Study. Gastroenterology. 152:1023-30 e2.

Ananthakrishnan AN, Khalili H, Konijeti GG, et al(2013). A prospective study of long-term intake of dietary fiber and risk of Crohn's disease and ulcerative colitis. Gastroenterology. 145:970-7.

Slavin (2004). Whole grains and human health. Nutrition research reviews, 17(1), 99–110. https://doi.org/10.1079/NRR200374

28. Sanders, L. M., Zhu, Y., Wilcox, M. L., Koecher, K., & Maki, K. C. (2021). Effects of Whole Grain Intake, Compared with Refined Grain, on Appetite and Energy Intake: A Systematic Review and Meta-Analysis. Advances in nutrition (Bethesda, Md.), 12(4), 1177–1195. https://doi.org/10.1093/advances/nmaa178 ang

https://www.fisaonline.de/en/findprojects/collaborativeprojects/details/?tx_fisaresearch_collaborativeprojects%5Baction%5D=institutionDetails&tx_fisaresearch_collaborativeprojects%5Bcontroller%5D=Institutions&tx_fisaresearch_collaborativeprojects%5Bi_id%5D=219&cHash=518f27a47d731584963c5a0f2e35a140

Sette, S., D'Addezio, L., Piccinelli, R., Hopkins, S., Le Donne, C., Ferrari, M., Mistura, L., & Turrini, A. (2017). Intakes of whole grain in an Italian sample of children, adolescents and adults. European journal of nutrition, 56(2), 521–533. https://doi.org/10.1007/s00394-015-1097-5

Liu, Zhang, Dou, Wang, Zhang, Zhang (2022).Recent progress in understanding the role and molecular mechanism of whole grains in disease regulation Food Science. (9) ,317-325

Johanan Espinosa-Ramírez., América Rodríguez., Julián De la Rosa-Millán., Erick Heredia-Olea., Esther Pérez-Carrillo.,Sergio O. Serna(2021).Shear-induced enhancement of technofunctional properties of whole grain flours through extrusion. Food Hydrocolloids Volume 111, February 2021, 106400.

Tan, Flood , Kifley, Russell, Cumming, Mitchell & Wang (2020). Wholegrain and legume consumption and the 5-year incidence of age-related cataract in the Blue Mountains Eye Study. The British journal of nutrition, 124(3), 306–315. https://doi.org/10.1017/S0007114520000104X

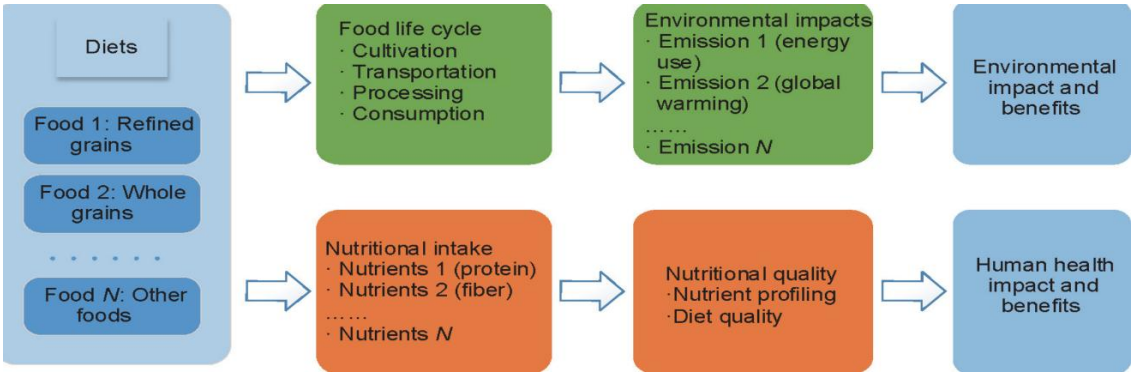

Fig. 1. A conceptual framework for diet-level integration of nutritional and environmental impacts assessments.

Source- *https://www.sciencedirect.com/science/article/pii/S2095311923004537.*