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Navigating the Nutrition Transition: What Is It? How Can Whole Grains Play a Helpful Role?

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SUMMARY

In this abstract I briefly describe the nutrition transition, how it is taking hold in low- and middle-income countries (LMICs) worldwide, and potential public health interventions emphasizing whole grain foods with a perspective on primordial prevention of noncommunicable chronic diseases (NCDs).

What Is the Nutrition Transition?

Fueled by urbanization and a global economy, the nutritional landscape in many LMICs has changed more rapidly over the last several decades than at any other time in history (10). In LMICs across diverse regions of the world, Western dietary patterns rich in processed meat, refined carbohydrates, and sugar-sweetened beverages are supplanting traditional diets. In addition to these unfavorable shifts in diet, individuals are decreasing their energy expenditure (9,10).

Concurrent with the nutrition transition, the burden of disease in LMICs has shifted from that of pestilence and famine to one of obesity and NCDs alongside nutrient deficiencies (i.e., epidemiologic transition) (8,14). In conjunction with these nutritional and epidemiological shifts, fertility and mortality rates continue to decline as countries become more industrialized (i.e., demographic transition) (8). And as a result, more deaths worldwide are now attributed to overweight and obesity than to underweight (14). Moreover, in LMICs the burden of diet and physical activity risks now equal that of HIV/AIDS and tuberculosis combined (14). In light of these changes, there is a clear need for a paradigm shift in LMIC public health nutrition efforts.

Whole Grain Intake in LMICs

In comparison to studies on sugar-sweetened beverages, dietary fat, protein, and sodium (all of which contribute to the nutrition transition), systematic research on trends in intake of whole grains in LMICs is sparse. Case studies suggest that intake of coarse grains such as sorghum and millet have declined significantly over the last several decades across Asia, Africa, and Latin America, and overall consumption of whole grains remains far below what is recommended (10). By contrast, refined grains such as white bread, rice, and biscuits are

becoming increasingly popular staple foods in many of these regions, and are disproportionately consumed by the poor. In Colombia, for example, carbohydrate intake is higher in low income families in children, while whole grain consumption in these children is lower (Figure 1 and Figure 2 present original data from Colombian children in the SIMBA study [7]).

Evidence for Whole Grains and NCDs

Unlike refined grains, whole grain foods contain ample fibers, resistant starches, vitamins, minerals, phytoestrogens, and antioxidants that may protect against NCDs (11). The epidemiologic evidence for the association between whole grain intake and NCDs is largely consistent, with most studies suggesting diets rich in whole grains are inversely associated with risk of type 2 diabetes (2), cardiovascular diseases (5), and cancer (1,3). In contrast, data from randomized controlled trials are less harmonious and larger high quality trials are warranted (16).

Whole Grains in Primordial Prevention

While the epidemic of (cardiovascular) risk factors has pervaded the consumer societies, it still has not reached the majority of the developing world. Real grassroot prevention should start by preserving entire risk factor epidemics. Here lies the possibility of averting one of tomorrow's world health problems. For expressing this important concept, I wish to propose the term of protoprophylaxis or primordial prevention.

—Dr. Toma Strasser, 1978

It has been over three decades since Dr. Strasser's proposal of the term "primordial prevention" and his clairvoyant prediction of the emergence of NCDs in LMICs (12). Fortunately, there may still be a glimmer of hope for preserving risk factor epidemics in these populations. Recent research indicates that policies to promote consumption of whole grains, fruits, vegetables, nuts, and fish and reduce intake of animal fats, and sodium could prevent millions of premature deaths worldwide (6). As children lag behind adults in experiencing the consequences of the nutrition transition, targeting youth for public health nutrition intervention may yield the greatest gains (8).

In addition to population-level policy efforts, educating individuals to replace refined grain staples with whole grain substitutes may be a step in the right direction. A recent study from Sun et al. found that substituting 50 g of white rice with brown rice was associated with a 16% decreased risk of type 2 diabetes, while substitution with other whole grains was associated with a 36% decreased diabetes risk (13). However, in an experimental trial, the substitution of white rice with brown rice over 16 weeks did not have any measureable effect on cardiometabolic disease outcomes in Chinese adults with, or at high risk of, type 2 diabetes (16). Future trials that are larger and longer, and that use alternative whole grain substitutes for refined-grain staples in LMICs are clearly warranted.

Barriers to Whole Grain Consumption

Notwithstanding the potential health benefits of whole grain foods, levels of whole-grain intake remain low in most parts of the world, including LMICs and their most vulnerable sub-populations. Thus, addressing the barriers to meeting the recommended levels of whole-grain intake in LMICs is an important research priority. A recent study by Zhang *et al.* reported that the main barriers to acceptance of brown rice were the rough texture, unpalatable taste, and higher price. However, after participants tried the brown rice, the majority indicated a willingness to substitute white rice with brown rice (15). Other reasons reported for low whole-grain intake include unfamiliarity with cooking whole grains, limited availability of whole-grain foods, and lack of awareness of the health benefits of whole grains (4).

Conclusion

Consuming more whole grain foods remains an important part of a healthful dietary pattern, and a way forward in the prevention of NCDs in regions of the world undergoing the nutrition transition. More observational and experimental research on palatable and affordable whole-grain substitutes for refined-grain staples in LMICs is warranted. Furthermore, considering intake in most countries remains very low, more research on the barriers to increasing whole-grain food consumption, on both the population and individual level, is needed to promote primordial prevention of nutrition related noncommunicable diseases.

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Fig. 1.
Mean carbohydrate (g) per 1000 Kcal in 1025 Colombian children aged 6–10 yrs by household income.

Fig. 2.
Percent carbohydrate as dietary fiber in 1025 Colombian children aged 6–10 yrs by household income.