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Original Research Article

Selected Socio-Demographic Factors and Whole Grains Perception and Eating Pattern of Teaching Staff in a State University in Laguna, Philippines

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Abstract

Consuming whole grains (WG) is essential in lowering the burden of non-communicable diseases; however, reports indicate poor intake. The study aimed to assess the influence of body mass index (BMI) and selected socio-demographic characteristics on the WG eating patterns of the teaching staff of a state university in Laguna. A descriptive cross-sectional study was conducted on 63 teaching staff aged 24 - 59. A food frequency questionnaire and BMI were used to evaluate the intake of whole grains and nutritional status, respectively. Over one-third (38.7%) of respondents were overweight, and their consumption of whole grains like brown rice, corn, wheat, barley, wild rice, quinoa, sorghum, and oats was reported as 1x a week to never. Boiled corn (63.49%), processed wheat, and oats were the primary types of whole grain consumed at least once a week during snack time and breakfast, with an approximate serving size of one cup/serving. No other determinants were associated, except for gender and oat intake. The study population considered whole grains to be nutritious, promote good health, and contain good carbohydrates and fiber sources suitable for persons with diabetes and heart disease. This information was mainly sourced from printed materials like books and journal articles (36.51%), supplemented by reports from both mass and social media (28.57%). The study observed a nearly nonexistent intake of whole grains. This highlights the urgent need to strengthen efforts to promote its intake to improve the quality of diets and address the increasing prevalence of overnutrition and noncommunicable diseases in the country. Additionally, the study suggests exploring the factors that hinder its consumption.

Keywords— consumption, whole grains, body mass index, health history

1 Introduction

The prevalence of non-communicable diseases (NCDs) and the so-called epidemic of chronic disease is a recent phenomenon in the twenty-first century. NCDs are a group of conditions, including cardiovascular disease, cancer, diabetes, and chronic lung illnesses. These conditions result from long-term health consequences and require long-term treatment and care. Meanwhile, overnutrition, including overweight and obesity, is caused by excessive intake of nutrients, leading to the abnormal or excessive accumulation of body fat that may impair health. Adults with a higher body mass index have an increased risk for NCDs. Overweight and obesity affect people worldwide, accounting for more than 1.9 billion adults and over 650 million adults in 2016, respectively [1]. Overweight and Obesity Atlas 2023 estimated that by 2035, over 4 billion people will be affected by these conditions [2]. In the Philippines, approximately 27 million Filipinos are overweight and obese. Adult overweight and obesity rates have nearly doubled over the past two decades, from 20.2% in 1998 to 36.6% in 2019. Meanwhile, NCDs are responsible for 74% of all deaths globally, according to data from the World Health Organization (WHO). Filipinos continue to be afflicted with NCDs, as indicated in the top causes of death in the country, including ischemic heart diseases, neoplasms, cerebrovascular diseases, diabetes mellitus, and pneumonia. Children, adults, and the elderly are particularly susceptible to the risk factors associated with NCDs, including an unhealthy diet and physical inactivity, among others. These modifiable behavioral risk factors may lead to metabolic risk factors, including overweight and obesity, raised blood pressure, high fasting blood glucose, and high blood cholesterol [3].

Several studies reported that the intake of whole grains (WG) can reduce the risk of overweight and obesity and non-communicable diseases, including cardiovascular diseases, type 2 diabetes, and certain cancers. Whole grains or foods made from them contain all the essential parts and naturally occurring nutrients of the entire grain seed in their original proportions. If the grain has been processed (e.g., cracked, crushed, rolled, extruded, and/or cooked), the food product should deliver the same rich balance of nutrients that are found in the original grain seed. This definition means that 100% of the original kernel – all of the bran, germ, and endosperm – must be present to qualify as a whole grain. According to the Whole Grains Council, the following food are considered WG when consumed in their bran, germ, and endosperm: amaranth, barley, buckwheat, corn (including popcorn and whole cornmeal), millet, oats (including oatmeal), quinoa, rice (both brown and colored), rye, sorghum (also called milo), teff, triticale, and wheat (including spelt, emmer, farro, einkorn, Kamut, and durum, as well as forms like bulgur, cracked wheat, and wheat berries) and wild rice [4].

WG are cereals implicated to have health benefits. With intact starchy endosperm, germ, and bran in either ground, cracked, or flaked forms, it makes them more nutritious than refined ones [4]. According to the Department of Science and Technology- Food and Nutrition Research Institute [DOST-FNRI], brown rice, undermilled pigmented red, purple, black rice, and other grains like sorghum, adlay, and quinoa are available in the Philippine Market. Whole corn and its products like hominy and popcorn, are also accessible in groceries and any local marketplace in the Philippines. Processed whole grain products, namely whole wheat bread, pasta, cereals, crackers, and biscuits, are examples of whole grain food items also available in the Philippines [5]. Quinoa is now gaining popularity among Filipino consumers as studies show its promising health benefits through the balance of protein, vitamins, and minerals, and high amounts of phytochemicals. Like barley, quinoa is not a staple in the Filipino diet [6]. While there may be production of these WG in the country, the volume is low, and most of the supply comes from imports. Half of the world is consuming white rice as a staple. Filipinos are rice eaters. However, a reduction in local rice production has recently been observed. The Department of Agriculture has considered investigating alternative sources of carbohydrates, such as corn, pigmented rice, adlay, and sorghum, to augment the rice shortage. This current crisis, however, provides an opportunity to promote WG and its consumption among

Filipinos [7].

Brown rice, corn, wheat, barley, quinoa, sorghum, and oats are among the most familiar and commonly consumed grains worldwide. They are available as locally produced or imported in the Philippine market. Other WG, such as adlay or adlai (*Coix lacryma-jobi L.*), is an additional staple crop in the Philippines. It is a tall, grain-bearing tropical plant from the family Gramineae or Poaceae. It is also called Job's tears of Asian origin. It is high in carbohydrates (73.9), protein (12.8), fat (1.0), and dietary fiber (0.3). It is packed with minerals such as calcium, phosphorus, iron, niacin, thiamine, and riboflavin. The grain is also used for medicinal purposes, such as in treating kidney stones [8]. Generally, WGs have high dietary fiber content due to their bran and germ. Moreover, they are said to have high bioactivity, nutrient content, and phytochemical content, which contains antioxidant, anti-inflammatory, and anti-carcinogenic activities [8]. As a good alternative to rice, WGs contain a significant amount of carbohydrates. Due to their dietary fiber and mineral content, which helps lower glycemic index (GI), they contribute to the regulation of blood sugar. In effect, the low GI properties of WGs prevent blood glucose spikes and promote longer satiety. On this note, individuals consuming a good amount of whole grains regularly may be less likely to overconsume calories, which can lead to overweight and obesity and a higher risk of non-communicable diseases or NCDs.

Despite this growing evidence of the health benefits of whole grain consumption, the recommendations regarding the amount of whole grain consumption to reduce the risk of overweight, obesity, and NCDs are unclear [9]. Further, no study has been conducted in the Philippines regarding the kind, amount, and frequency of whole grain consumption by Filipinos and their relationship with overweight, obesity, and NCDs, which may help formulate recommendations on whole grain consumption.

This research was conducted to serve as a basic groundwork study in determining the whole grain consumption of Filipino adults and its relationship to BMI and noncommunicable disease history. Further, this study may provide data to help the nutrition and health organizations, the academe, the government, and policymakers formulate recommendations and promote the consumption of whole grains in the Philippines. The result of this study may also serve as a basis for further research on the environmental factors affecting the consumption of healthy diets. The study generally aimed to determine the actual eating pattern of WGs and their relationship to the BMI of teaching staff aged 24–59 years old employed at a State University in Laguna. Specifically, the study aimed to:

1. Describe the sociodemographic and health history of the participants
2. Determine the kind, amount, and frequency of whole grain consumption using a structured, pretested semi-quantitative food frequency questionnaire
3. Assess the BMI of the participants using the World Health Organization BMI classification
4. Determine the perception and source of information of the respondents on whole grains
5. Evaluate the relationship of whole grain consumption, BMI, and selected sociodemographic factors

2 Methodology

2.1 Study Design, Locale, and Participants

A descriptive cross-sectional research design was employed in this study with the aim of investigating the eating pattern of WGs and perception of their consumption among teaching staff at a State University in Laguna. The relationship between BMI and selected socio-economic variables to the WG eating pattern was also determined in this study. The study was carried out between April – May 2024. The participants were randomly selected from the list of teaching staff or faculty members during the academic year 2023-2024.

2.2 Sample Size and Sampling

The University's Human Resources Office reported 95 regular teaching staff during the study period. Using this data, the sample size of 76 was determined using Slovin's formula:

$$n = \frac{N}{1 + Ne^2} \tag{1}$$

where: n = sample size, N = total population, and e = sampling error (5%) confidence level of 95%.

A simple random technique was adopted to select the 76 participants. Teaching staff who were pregnant and lactating, inactive, with food allergies specific to whole grains, and with diet restrictions that limit and or exclude whole grains were excluded from the study.

2.3 Data Collection Tool

The study utilized a structured, pretested survey questionnaire divided into three distinct parts:

1. Sociodemographic and Health History
2. Food Frequency Questionnaire (FFQ)
3. Perception on WGs consumption

The questionnaire utilized in this study was modified from the study of Ross *et al.* [10] entitled Validation of a Food Frequency Questionnaire for Estimating Whole-Grain Cereal Food Intake. The modification was carried out through a review of the literature and a local and online search of the market to ensure that the most common and available whole grains in the Philippines will be included in the list of food items. After which, the questionnaire has undergone content validation by six (6) nutrition experts from the academe and was pre-tested among 12 faculty staff from a different state university. Prior to the finalization of the survey tool, the pre-testing has led to revisions that promote ease of understanding and answering the survey questions among participants of the study.

The socioeconomic status and health history section of the questionnaire required participants to provide their age, gender, level of education, and household monthly income. In addition, this section asked about the current health condition of the participants, their family history of diseases, and self-reported measures of their height (in meters and feet) and weight (in kilograms). On the other hand, the second section, the FFQ, was utilized to gather data on the participants' frequency of WG consumption and the approximate amount in household measures. In addition, WGs eating pattern consisted of questions on meal pattern or time of consumption, types of preparation, and estimated cost per serving consumed. The FFQ was developed through a literature search of the most familiar and commonly consumed WGs in the Philippines. Nine (9) whole grains were added from the list of food in the FFQ, namely: (1) brown rice and products, (2) corn and products, (3) wheat and products, (4) barley and products, (5) Quinoa, (6) sorghum, (7) oats and (9) other WGs not on the list. WG consumption reflected the past month's intake. Lastly, questions about the participants' perception of the consumption of WG in general and their source of information were asked.

The data collected from the survey questionnaires' section on socio-demographic and health history were encoded, summarized, and cleaned using the Excel form. The BMI was calculated using the reported height in meters and weight in kilograms. The formula below was used for the BMI calculation:

$$Body\ mass\ index\ (BMI) = \frac{weight\ in\ kg}{(height\ in\ m)^2} \tag{2}$$

The resulting BMI value was interpreted using the World Health Organization (WHO) BMI Cut-off Points for Adults where: Normal: $18.5 - 24.99\ kg/m^2$, Underweight: $< 18.5\ kg/m^2$, Overweight:

$25.0 - 29.99\ kg/m^2$, and Obese: $>= 30\ kg/m^2$.

The answers in the semi-quantitative FFQ were individually analyzed for the estimation of the amount of consumption in household measures, such as a cup, from the frequency and usual serving per intake. The answers to the perception and information source questions were summarized and coded for the common answers.

2.4 Data Collection Method

Data from participants were collected using an online survey form and through face-to-face interviews from April and May 2024. The Google form was used to construct the online questionnaire. Participants who participated online were asked to provide their consent by clicking a designated tick box in the form. Their consent to participate was confirmed as they completed the questionnaires. Participants who opted to be interviewed personally were scheduled according to their availability. The interview was held in a designated area of the University for a maximum of 20-30 minutes for each interviewee.

2.5 Data Analysis

Mean and averages, minimum and maximum values, as well as frequency and percentages, were used to describe the data. Meanwhile, the Chi-square test was utilized to determine the relationship between quantitative factors with $p<0.05$.

2.6 Ethical Considerations

Before the data collection, a formal letter requesting permission to conduct the study was sent to the Campus Director and the Human Resource Office of the participating University. The letter contained the background and objectives of the study. Upon the approval of the request, all randomly selected participants were contacted to provide information about the study and to seek consent using an informed consent form. The data collection was performed by the Data Privacy Act of 2012 using a questionnaire once the consent of the participants was obtained. No data collection commenced without the participant's consent.

3 Results and Discussion

3.1 Sociodemographic and Health History of the Participants

With an overall response rate of 83% (63 out of 76 randomly selected participants), the survey studied 63 teaching staff of a State University with a mean age of 40 years old. The majority (58.73%) of the participants were female and had a master's degree (60.32%). The majority (about 80%) of the participants have a household monthly income ranging from 25,000 to below 55,000 pesos. The rest (20%) earns 55000 pesos per month (see Table 1).

Table 1. Sociodemographic and health history of teaching staff at a state university in Laguna, n=63

CHARACTERISTICS	FREQUENCY	PERCENTAGE
Gender		
Male	26	41.27
Female	37	58.73
Educational Attainment		
Masteral Studies	38	60.32
PhD and Postdoctoral	25	39.68
Monthly Income (PhP)		
25,000-39,999	25	39.68
40,000-54,999	24	38.10
55,000 - up	14	22.22
Body Mass Index		
Normal	27	42.86
Overweight	24	38.10
Obese	12	19.05
Present Disease Condition		
Hypertension	15	23.81
Diabetes Mellitus	3	4.76
Hypertension and Diabetes Mellitus	4	6.35
Hypertension and Heart Disease	2	3.17
No Answer	39	61.90
Family Medical History		
Hypertension	12	19.05
Diabetes Mellitus	5	7.94
Hypertension and Diabetes Mellitus	7	11.11
Hypertension and Heart Disease	5	7.94
Hypertension, Diabetes Mellitus and Heart Disease	4	6.35
Kidney Disease	2	3.17
Hypertension and Cancer	5	7.94
Heart Disease, Diabetes Mellitus, Kidney Disease	4	6.35
Heart Disease, Diabetes Mellitus, Kidney Disease, Cancer	8	12.70
No Answer	11	17.46

3.2 Health History and Nutritional Status of the Study Participants

More than one-third (38%) of the respondents reported having current medical conditions associated with NCDs. About 75% of them were overweight and obese and had a family medical history of NCDs. The most commonly reported cases of NCD were hypertension (63%), followed by type 2 diabetes mellitus (17%) and a combination of diseases, such as any combination of hypertension, type 2 diabetes mellitus, and heart diseases. The current medical conditions reported by the participants reflected their family medical history of NCDs, with hypertension being the most common (23%) (see Table 2).

Table 2. Health history and nutritional status of teaching staff at a state university in Laguna on whole grains in the diet, n=63

HEALTH HISTORY	FREQUENCY	NUTRITIONAL STATUS*					
		Normal		Overweight		Obese	
		Male	Female	Male	Female	Male	Female
Present Disease Condition							
Hypertension	15	2	5	3	1	1	3
Diabetes Mellitus	3	0	0	0	2	0	1
Hypertension and Diabetes Mellitus	4	0	0	0	2	0	2
Hypertension and Heart Disease	2	0	0	1	1	0	0
No Answer	39	-	-	-	-	-	-
Family Medical History							
Hypertension	12	4	1	3	4	0	0
Diabetes Mellitus	5	0	3	1	0	1	0
Hypertension and Diabetes Mellitus	7	0	0	1	1	2	3
Hypertension and Heart Disease	5	0	1	1	1	1	1
Hypertension, Diabetes Mellitus and Heart	4	0	1	0	1	1	1
Kidney Disease	2	0	0	0	2	0	0
Hypertension and Cancer	5	1	1	0	1	0	2
Heart, Diabetes Mellitus, Kidney Disease	4	0	0	3	1	1	0
Heart, Diabetes Mellitus, Kidney Disease, Cancer	8	0	2	1	2	0	3
No Answer	11	-	-	-	-	-	-

*Based on WHO BMI Classification

3.3 Whole Grains Eating Pattern

More than half of the respondents eat at least one of the WG, with corn as the most frequently eaten (63%), followed by wheat (60%) and oats (56%) (Figure 1). On the other hand, about three-quarters of the respondents have never eaten brown rice, and a quarter have never eaten brown rice or corn. About 10% of the respondents have never eaten any of the mentioned WG on the list.

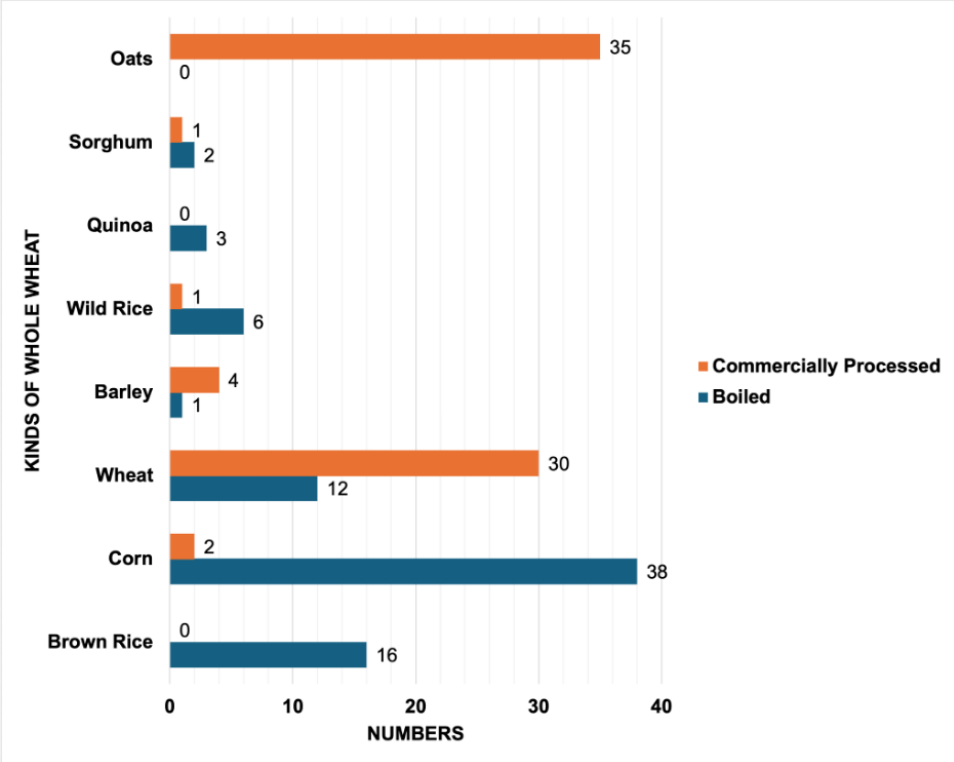

Figure 1.
Form of whole grains consumed by selected faculty members at a state university in Laguna. Data may have multiple responses.

Of the 24% brown rice eaters, almost half (46%) consumed brown rice at dinner time, with ½ to 1 cup as the average amount of consumption. Brown rice is frequently consumed as boiled or steamed. In a study by Hopio and delos Reyes in 2017 on the consumption pattern of specialty rice in municipalities in Laguna, brown rice was the most commonly consumed type of specialty rice [9]. Weekly volume consumed is also higher for brown rice, recorded at an average of 2.89 kg per week. Consequently, Pabuayon and Quilloy in 2011, noted that the estimated monthly consumption of brown rice was low at 6.75 kg per household [11].

Over half (63%) of the respondents reported eating corn in the past month. Corn is consumed frequently during snack time (63%) as a snack in the morning or in the afternoon. Some (30%) respondents consumed corn at different times of the day, such as breakfast, snack time, and dinner. The usual serving size of corn per consumption is 1 cup, one whole corn, one corn on the cob, or one piece (85%). Corn is commonly consumed boiled among the majority of respondents (83%). The reported intake of corn, wheat, and oats by the respondents may be explained by the fact that corn ranks as the second most important staple food in the Philippines, following rice. Similar to corn, the availability and accessibility of processed, ready-to-eat wheat and oats in the market may have contributed to the observed relatively regular consumption. In addition, the awareness of the significance of overall health and well-being is rising in the country partly due to the COVID-19 pandemic and reports on the increasing prevalence of NCDs and overnutrition.

About 60% of respondents have eaten wheat in the past month. Wheat was frequently consumed during breakfast (50%) and snack time (28%). About three-quarters (73%) consumed processed wheat products. Consumption of wheat among respondents has an average amount of 1 pack, 1 cup, or one piece, depending on the wheat product consumed. At present, the WG products available in the market are in the following forms: breakfast cereals, breads, flour, pasta, and snack items, namely biscuits, cookies, crackers and popcorn. To increase its utilization, considering its

health benefits, the versatility of WG may be highlighted in traditional Filipino dishes like *Arroz caldo* and *goto*, rice cakes such as *suman* and *bibingka* and in many variations of *pancit*, breads and biscuits, namely *rosquillos*, *otap*, *barquillos*, *paborita*, *paciencia*, *uraro*, and *puto seko* just to name a few, using WG flour. Incorporating pigmented rice with the customary white rice will also provide a nutritious and healthier twist on a classic plate.

Oats are consumed by more than half (56%) of the respondents as boiled (65%) or processed (29%), with the usual serving size of 1 cup (66%) during breakfast (63%). On the other hand, barley, quinoa, and sorghum consumption among respondents was observed to be very low, with only about 8%, 3%, and 5%, respectively. Sorghum, which is a known crop in the Philippines, is highly valued as livestock feeds, except for the sweet sorghum variety that is intended for human consumption. Its low intake may be attributed to the low campaign of sorghum for human consumption. Similarly, there was no reported consumption of wild rice among respondents in the past month (Table 3).

Table 3. Frequency and time of consumption of one cup/serving of whole grains of teaching staff at a state university in Laguna, n=63

WHOLE GRAINS	FREQUENCY OF CONSUMPTION		MEAL TIME*			
	Never	At least 1x/wk	Breakfast	Lunch	Dinner	Snack
Brown Rice	47 (74.60%)	16 (25.40%)	8	6	9	1
Corn	23 (36.51%)	40 (63.49%)	5	2	2	36
Wheat	23 (36.51%)	40 (63.49%)	31	4	3	16
Barley	58 (92.06%)	5 (7.94%)	2	0	1	2
Wild Rice	56 (88.89%)	7 (11.11%)	3	6	0	1
Quinoa	60 (95.24%)	3 (4.76%)	0	0	1	2
Sorghum	60 (95.24%)	3 (4.76%)	1	1	0	1
Oats	28 (44.44%)	35 (55.56%)	29	3	7	6

*May have multiple responses

The study only shows that whole grain consumption is still low among the respondents. Respondents only consumed whole grains and whole grain products once a week for corn and brown rice, and one to three times a week for oats. The usual amount of consumption falls below the recommended daily intake for whole grains, which is three (3) to five (5) servings of whole grains per day, roughly around 70-90 grams, to reduce the risk of various nutrition-related diseases for people aged nine and up. The observed poor intake of whole grains among the study population in this study was similar to the report gathered by Agdeppa and Platon-Desnacido *et al.* [5]. In the dietary component of the 2019 Expanded National Nutrition Survey, only slightly less than half of the participants consume whole grains once a month, often during breakfast. Consumers of WG were noted to belong to a high-income group and reside in urban areas. Whole grains contain substantial amounts of bran, germ, and endosperm, resembling an almost intact grain. Intact grains hold the essential nutrients, dietary fiber, and phytochemicals that provide many protective mechanisms, such as improvement in the gut environment, stronger immunity, blood lipid improvement, antioxidant defense, and some weight loss [12]. In Singapore, a retrospective cross-sectional study on the whole grain intake of expectant mothers from the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) mother-offspring cohort study was conducted, and the findings showed

that only 30% of the women were taking in whole grains with an average intake of 23.6 g. This was observed to be way below the recommendation in Singapore. The study recommended the development and increase in the availability of whole grain products to encourage higher intake [13]. Despite the well-documented health benefits, the global consumption of whole grains remains significantly below the recommended amounts of a minimum of 3 servings/day [14, 15, 16]. Many food and health organizations recommend eating three (3) to five (5) servings of whole grains per day, roughly around 70-90 grams to reduce the risk of various nutrition-related diseases for people aged 9 and up [5].

This could be due to the various barriers to WGs' consumption. In the study of Foster *et al.* [17] in Australia, it was reported that more than three-quarters of the study participants were consuming grains less than the recommended per day based on age and gender. Refined varieties of white pasta, followed by white rice and whole-grain bread, were noted to be the most frequently purchased. Education, cost and taste were the common factors mentioned by the participants that aided them in their selection of whole-grain foods [17]. Consequently, similar results were observed in an online survey conducted among Iranian students, suggesting price, parents not purchasing whole grains, students not reading the nutritional labels, insufficient information on other benefits of whole-grain products, and peer effect as the common barriers to WG's consumption. Moreover, the same study noted that lack of access and sensory appeal were also considered barriers [18]. Good taste is a crucial criterion for selecting food items. However, whole grains are described as being relatively hard and heavy in texture, and dark in appearance, imparting a nutty odor and bitter flavor compared with refined grains. The bioactive compounds in whole grains are known for their health benefits but their impacts on flavor, texture, odor, and color are far from desirable. The phenols located in the outer layer of the grain, for instance, are associated with bitter and pungent tastes. Moreover, the high lipid content in the bran and germ makes the whole grain products more prone to oxidation and rancidity. Off flavors are produced when the whole grains turn rancid. These sensory concerns must be addressed to improve acceptability and raise the consumption of whole-grain products [19]. In the Philippine setting, non-use or discontinued use of brown rice, for example, was due to its high price, not being readily available, poor eating quality and the limited information about it among consumers [20].

Moreover, the usual pattern of intake reveals a low variation in whole grain consumption. Whole grain consumption was observed to be common on certain types, which are widely available as raw or processed. This is true in the case of corn, where availability is dictated by the year-round harvest. In the case of wheat, since this whole grain is a usual ingredient in many commonly consumed cooked dishes, wheat is considered a frequently consumed whole grain among respondents. Further, bread is eaten by Filipinos at any time of the day, thus resulting in the volume growth of the import of wheat from the Philippines. Processed products like breads, cookies, and pastries are reformulated with whole wheat and oats to improve nutritional and health values [20]. Oats, on the other hand, are available in their processed form and only require minimal to no preparation before consumption.

Perhaps the availability and, to some extent, although not covered in this present study, cultural factors may have played a role in the consumption pattern of whole grains among respondents. It is also worth noting that there is growing attention to healthy eating habits to promote overall health and wellness, especially after the COVID-19 pandemic. Oats, brown rice, and wheat, along with other types of whole grains, are considered healthier options. The awareness of health has also increased the consumers' willingness to invest more in their health and wellness. This has been observed in the past year in Asian countries such as the Philippines and Malaysia [19]. Aside from improved health, increased intakes of whole grains together with legumes and nuts with subsequently reduced intakes of red, processed meats, and sugar-sweetened beverages showed evidence to project gains in life expectancy.

3.4 Perception of WG consumption and Sources of Information

With the advent of the internet and free information access to social media platforms, there is an obvious challenge to correct and reliable information due to the proliferation of misinformation and unhealthy food trends.

This present study also looked into the respondents' sources of information about whole grains. Results of the survey showed that the primary source of nutrition and health information was reading books, articles, and journals (38.5%), followed by social media platforms (28.5%) Figure 2.

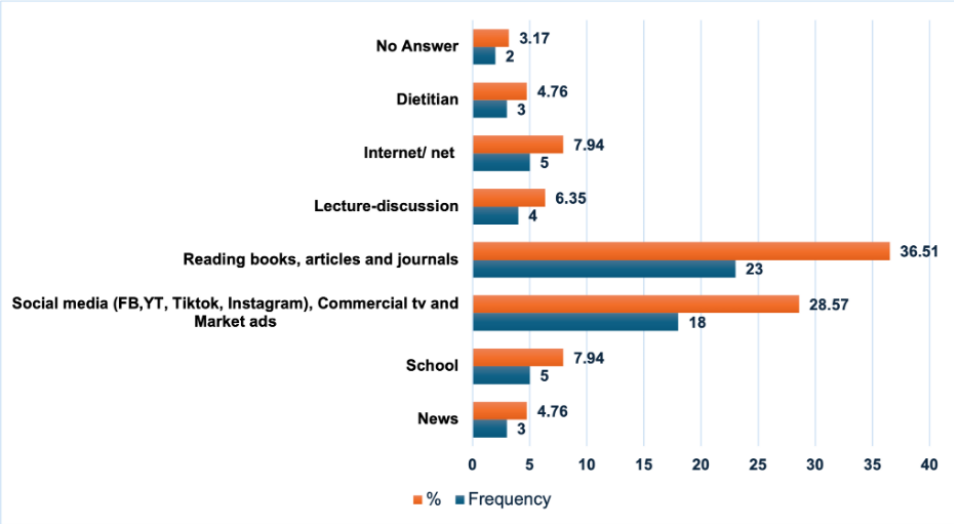

Figure 2.
The main source of nutrition and health information of selected faculty members.

Consequently, the respondents' perceptions about whole grains were collected and analyzed. The results showed that two-thirds (64%) of the respondents generally viewed whole grains as healthy, nutritious, and a good source of carbohydrates and fiber, which was beneficial for the heart (Figure 3). About 5% of the respondents reported that they perceived the different types of whole grains as healthy alternatives to rice. And on that note, 6% believed that whole grains are good for the management of diabetes mellitus. While the majority (86%) believed that whole grains are beneficial to health, about 5% of the respondents perceived whole grains to cause a sudden rise in blood sugar levels and increase body fat. Those who have perceived whole grains negatively reported that they got the information from books, journals, articles, and personal experiences.

Further, 5% of the respondents have also perceived whole grains as healthy but are difficult to cook and spoil easily. While 9% of respondents did not give their opinion about whole grains and their possible health benefits. The results of the perception study showed a positive perception of whole grains in general but also revealed the limitations of not consuming them regularly in the right amounts despite their perceived health benefits.

The findings contradict the common belief that higher education correlates with better knowledge and health outcomes [21]. Studies have noted that knowledge often does not translate into practice like on the issues of healthcare due to the challenge in implementation that requires a change in established routines in addition to the difference between declarative knowledge gained from reading and watching and practical/procedural knowledge. Furthermore, resistance to change and misalignment between the purpose of the knowledge producers and the needs of the users significantly influence the practice despite knowing just like the observed data gathered [22].

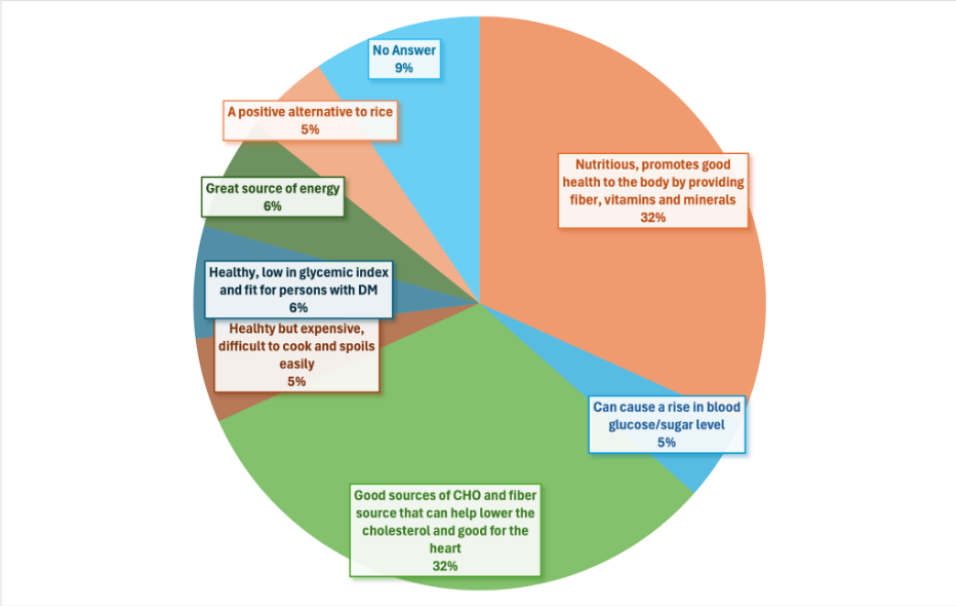

Figure 3.
Perception of teaching staff at a state university in Laguna on whole grains in the diet, n=63. Data may have multiple responses

3.5 Present medical condition, medical history, and nutritional status

Among the respondents, two-thirds (63%) reported to have hypertension regardless of gender and nutritional status. Those respondents who reported having diabetes and heart diseases with or without hypertension were mostly overweight and obese, regardless of gender. Consequently, hypertension was reported to be the primary family medical history (21%), followed by a combination of hypertension, diabetes, heart disease, and kidney disease (15%). It was also observed that the majority of respondents who reported having a family history of NCDs were overweight and obese regardless of their gender.

In 2019, the WHO reported that 68% of deaths among individuals aged 30-70 in the Philippines were caused by NCDs. The paper emphasized the surge in healthcare costs, social care, and welfare support needs in managing the rising prevalence of NCDs. Furthermore, not addressing the issue results in a significant reduction in economic output. The intensive sale promotion of processed ready-to-eat food items and unhealthy diets and lifestyles were the two underlying and behavioral factors causing significant in the burgeoning of these diseases in the country.

Overweight and obesity are the major risk factors for the developing chronic NCDs. A high BMI correlates significantly to NCDs, including hypertension and all causes of death. Unhealthy diet is widely known as one of the major risk factors for overweight and obesity and NCDs. To improve dietary intake worldwide and help reduce the prevalence of overweight, obesity, and NCDs, dietary guidelines worldwide incorporate consumption of whole grains as part of their recommendations due to growing evidence of its positive health effects in ways other than merely supplying energy and nutrients [22]. In fact, evidence-based guidelines from the American Heart Association (AHA), American College of Cardiology (ACC), and the International Society of Hypertension emphasize the importance of increasing intake of whole grains to promote cardiovascular health.

Diet had the strongest evidence of an effect on non-communicable diseases. Low intake of whole grains, fruits, vegetables, nuts, and seeds constitutes a poor diet quality, a major risk factor for NCDs. Overweight and obesity increases the risk of developing NCDs, highlighting the importance of making healthier food choices, such as incorporating more whole grains into the diet. In this present study, a minimal intake of whole grains was found which is consistent with existing literature

that reports the poor consumption of whole grains by people worldwide. The primary obstacles to consuming sufficient whole grains may be their greater cost and limited availability [14].

The aggressive marketing of processed foods high in sugar, salt, and fat often features appealing visuals, catchy slogans, and promotional discounts to lure consumers. They pack these items conveniently to meet the needs of consumers for a quick meal solution to match their fast-paced and busy lifestyles. Moreover, statements of health claims such as "fortified with nutrients", "less fat or salt" mislead consumers into thinking that it is a practical and affordable healthy option compared and or comparable to fresh whole foods. These marketing tactics influence the consumer's preferences leading to high consumption. Whole grains contain substantial amounts of bran, germ, and endosperm, resembling an almost intact grain. Intact grains hold the essential nutrients, dietary fiber, and phytochemicals that provide many protective mechanisms such as improvement in the gut environment, stronger immunity, blood lipid improvement, antioxidant defense, and some weight loss [8]. Aside from improved health, increased intakes of whole grains together with legumes and nuts with subsequently reduced intakes of red processed meats and sugar-sweetened beverages were reported to project gains in life expectancy [15].

3.6 Relationship of Whole Grains Consumption with Gender, Educational Status, Monthly Income and Nutritional Status

The analysis of the results showed no associations found between WG consumption and gender, educational status, monthly income and BMI except for a notable link between gender and oat intake (Table 4, 5, and 6). Oatmeal is one of the staple breakfast items in Western countries. Interest in oatmeal has grown in developing countries due to its perceived health benefits, affordability, and versatility. Oatmeal is rich in fiber and a good source of protein and minerals. Although oatmeal is an imported commodity in the Philippines, its consumption surged during the pandemic as many home cooks sought convenient and nutrient-rich meals. Oatmeal can be mixed with milk, yogurt, honey, nuts, and fruits and incorporated into baked goods and smoothies, appealing to many health-conscious Filipinos since the pandemic [16]. Other related studies show a positive impact of brown rice on the metabolic risk factors among overweight and obese Filipino adults. After a week-dietary intervention and follow-up, more metabolic risk factors were significantly reduced at post-intervention in the brown rice (BR) group [body mass index (BMI), visceral fat (VF), systolic BP (SBP), diastolic BP (DBP), FBS, total cholesterol (TC), and low-density lipoprotein (LDL)] than in the white rice (WR) group [SBP, DBP, TC, LDL, and triglycerides (TG)]. Most of the parameters in the BR group significantly improved at follow-up including the high-density lipoprotein (HDL) [16].

Like the reports, females were observed to be more health-conscious than males. Females were noted to report more about their dietary changes than their male counterparts. Moreover, females were described as more anxious about having unhealthy diets than males thus they gathered more health information [23, 24].

Despite the health benefits of WG in reducing the risk of cardiovascular diseases, obesity, type 2 diabetes mellitus and cancer, it has not gained widespread popularity due to factors such as cost, availability, awareness, cultural preference, taste, and texture. These grains' (brown rice, corn, wheat, barley, wild rice, quinoa, sorghum and oats) limited availability and relatively higher cost than rice hinder their adoption. Furthermore, introducing grains with different sensory characteristics and insufficient knowledge on how to incorporate them into traditional meals greatly impede its acceptability to Filipinos who are used to rice's organoleptic properties [8, 20].

The study only revealed that among the participants, the consumption patterns of whole grains were not dependent on factors such as socio-demographic, economic, health history, perception, and source of income. Perhaps the lack of significant association between almost all variables and the whole consumption pattern may be attributed to the smaller sample size used in the present

Table 4. Relationship of corn, wheat and oat consumptions with gender, educational status, monthly income and BMI of teaching staff at a state university in Laguna, n=6

CHARACTERISTICS		CORN				WHEAT				OATS			
		Never	At least 1x/week	Chi Square X^2	P values	Never	At least 1x/week	Chi Square X^2	P values	Never	At least 1x/week	Chi Square X^2	P values
Gender	Male 26 (41.3)	9	17	0.68	0.794	13	13	3.477	0.062	16	10	5.239	0.022*
	Female 37 (58.7)	14	23			10	27			12	25		
Educational Attainment	Masteral Studies 38 (60.3)	14	24	0.005	0.946	14	24	0.005	0.946	18	20	0.332	0.565
	PhD and Post Doctorate 25 (39.7)	9	16			9	16			10	15		
Monthly Income (P)	25,000-39,999 25 (39.7)	10	15	0.24	0.887	9	16	0.017	0.992	14	11	2.253	0.324
	40,000-54,999 24 (38.1)	8	16			9	15			9	15		
	55,000 - up 14(22.2)	5	9			5	9			5	9		
Body Mass Index	Normal 27 (42.8)	10	17	0.964	0.617	7	20	2.343	0.31	10	17	3.075	0.215
	Overweight 24 (38.1)	10	14			11	13			10	14		
	Obese 12 (19.1)	3	9			5	7			8	4		

At 5% level of significance
*Significant association

Table 5. Relationship of Brown Rice, Barley and Wild Rice Consumptions with Gender, Educational Status, Monthly Income and BMI of teaching staff at a state university in Laguna, n=63

CHARACTERISTICS		BROWN RICE				BARLEY				WILD RICE			
		Never	At least 1x/week	Chi Square X^2	P values	Never	At least 1x/week	Chi Square X^2	P values	Never	At least 1x/week	Chi Square X^2	P values
Gender	Female 37 (58.7)	26	11	0.637	0.425	34	3	0.937	0.333	33	4	0.406	0.524
	Masteral Studies 38 (60.3)	27	11			36	2			33	5		
Educational Attainment	PhD and Post Doctorate 25 (39.7)	20	5			22	3			23	2		
Monthly Income (P)	25,000-39,999 25 (39.7)	22	3	5.838	0.054	22	3	1.044	0.593	22	3	2.701	0.259
	40,000-54,999 24 (38.1)	14	10			23	1			23	1		
	55,000 - up 14(22.2)	11	3			13	1			11	3		
Body Mass Index	Normal 27 (42.8)	19	8	0.74	0.691	26	1	1.349	0.509	24	3	0.563	0.755
	Overweight 24 (38.1)	18	6			21	3			22	2		
	Obese 12 (19.1)	10	2			11	1			10	2		

At 5% level of significance
*Significant association

Table 6. Relationship of Quinoa and Sorghum Consumptions with Gender, Educational Status, Monthly Income and BMI of teaching staff at a state university in Laguna, n=63

CHARACTERISTICS		QUINOA				SORGHUM			
		Never	At least 1x/week	Chi Square X^2	P values	Never	At least 1x/week	Chi Square X^2	P values
Gender	Male 26 (41.3)	24	2	0.838	0.36	24	2	0.838	0.36
	Female 37 (58.7)	36	1			36	1		
Educational Attainment	Masteral Studies 38 (60.3)	35	3	2.072	0.15	35	3	2.076	0.15
	PhD and Post Doctorate 25 (39.7)	25	0			25	0		
Monthly Income (P)	25,000-39,999 25 (39.7)	24	1	0.226	0.893	23	2	1.953	0.377
	40,000-54,999 24 (38.1)	23	1			24	0		
	55,000 - up 14(22.2)	13	1			13	1		
Body Mass Index	Normal 27 (42.8)	25	2	0.103	0.596	24	3	4.2	0.122
	Overweight 24 (38.1)	23	1			24	0		
	Obese 12 (19.1)	12	0			12	0		

At 5% level of significance
*Significant association

study. Further, being a male faculty member showed a significant relationship to whole grain consumption patterns, particularly oats. While no literature supports the same results, consumption of oats was associated with lower heart disease risk in men [25].

This present study showed a low frequency and below-recommended intake of whole grains among the teaching staff in a state university. The three most commonly consumed WG include corn, oats, and wheat. Frequency of consumption may be attributed to known factors such as availability and the usual pattern of consumption. Despite high awareness of the perceived positive health effects of WG, a few respondents still noted some negative perceptions about whole grain consumption, such as being difficult to cook or prepare, inducing body fatness, and promoting elevation of blood sugar levels. The mentioned negative perceptions may influence the decision to consume whole grains in general. The study also revealed a high prevalence of overweight and obesity, current medical conditions, and family medical history of NCDs. This finding corroborates with a previous study among faculty members of a Philippine university which showed increased adiposity as depicted by the measurement of waist circumference and an associated increase in fasting blood sugar, triglyceride and blood pressure [26].

The evidence suggests that low intake of whole grains, fruits, vegetables, nuts, and seeds constitutes a poor diet quality, a major risk factor for NCDs. Overnutrition increases the risk of developing NCDs, highlighting the importance of making healthier food choices, such as incorporating more whole grains into the diet. In this present study, a minimal intake of whole grains was found, which is consistent with existing literature that reports the poor consumption of whole grains by people worldwide. Likewise, the findings of a study on the diet diversity, nutrition and health status of a specific occupational group (cargo truck drivers) showed a moderate diet diversity score and below 75% mean nutrient adequacy ratio which implies the importance of optimal diet quality for instance, the consumption of WG [27]. The primary obstacles to consuming sufficient whole grains

may be their greater cost and limited availability [4, 14]. The findings also contradict the common belief that higher education correlates with better knowledge and health outcomes [28, 29].

Moreover, promoting the consumption of whole grains may utilize social media and other internet-based platforms. The use of multimedia platforms to prominently campaign the consumption of whole grains may be effective in increasing public awareness of nutrition and health issues and fostering positive changes in health behaviors. Mass and social media, as tools for communication, reach a large audience where information can be creatively broadcast, enabling interaction and feedback among users [30, 31]. The effect of social media on disseminating health and nutrition information has a significant influence for instance, in regard to the behavior of young people on nutrition, dieting, eating disorders and body image. In a study among middle-adolescent students on perceived nutritional status, body satisfaction and fad dieting it was found that the study population were practicing fad dieting and unhealthy dietary practices [32]. Promoting media literacy education as an alternative tool for the healthy regulation of media use rather than the conservative approach of limiting social media use among young people has been recommended although, there has been no comprehensive literature on this [30].

4 Conclusion

The study was participated by male and female teaching staff with a mean age of 40. The majority have at least a master's degree and earn a minimum of 25,000 pesos per month. Less than half of the respondents have a ,normal BMI, while the majority were considered overweight and obese. Over one-third have a current medical condition and the majority of them have a family history of non-communicable diseases such as heart disease, type 2 diabetes mellitus, and hypertension. This present study showed a low frequency and below-recommended intake of whole grains, with the three most commonly consumed WG including corn, oats, and wheat. Despite high awareness of the perceived positive health effects of WG, a few respondents still noted some negative perceptions about whole grain consumption, such as being difficult to cook or prepare, inducing body fatness, and promoting elevation of blood sugar levels. There were no associations between selected variables of socio-demographic factors, health history and BMI to the eating pattern of WGs, except for gender and oat intake. While there was no association with the variables mentioned, the findings of this study have to be seen in light of some limitations such as the dietary intake on WG was self reported. Moreover, a snapshot of the whole grain consumption was gathered and not the changes over time.

This study recommends that future studies focus not only on the consumption patterns but also on the behaviors surrounding the consumption of WG, which can uncover the possible barriers to consumption. While in this study, the relationship between the consumption of WGs and nutritional status has not been established, the high prevalence of overweight and obesity among the participants is still alarming and must be addressed through means other than a healthy diet. Genetic predisposition and aging can increase the risk of NCDs, but efforts may be focused on modifiable factors such as body weight through the consumption of healthier foods such as WGs. It is recommended to increase campaign efforts to promote the locally available WGs and WG products and its health benefits in lessening the risk to overweight, obesity and lifestyle related diseases. Increased consumption of vitamins and mineral rich whole grains can also help curb micronutrient deficiency in the country. households, and organizations involved.

Statements and Declarations

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Competing Interest

The authors declare no conflicts of interest.

Ethical Considerations

The researchers recognize the importance of safeguarding the human participants as well as the researchers in conducting research studies. All researchers read, understood, and followed the National Ethical Guidelines for Research Involving Human Participants (NEGRIHP) 2022. All participants were contacted to provide information about the study and to seek consent using an informed consent form. The data collection was performed by the Data Privacy Act of 2012 using a questionnaire once the consent of the participants was obtained. No data collection commenced without the participant's consent.

Data Availability

The data in this study is available upon request from the authors.

Author Contributions

All authors contributed to the conceptualization of the research proposal, design and development of the research instrument. **M.J.C.V.** performed the collection, acquisition of data and writing of the manuscript. **A.K.M.B.**, **J.I.D.**, and **A.S.A.B.** analyzed, reviewed and edited the manuscript. All authors have read and agreed to the published version of the manuscript.

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