

KNOWLEDGE AND DIETARY PRACTICES ON PROBIOTIC DAIRY PRODUCTS AMONG SELECTED FILIPINOS IN ORIENTAL MINDORO, PHILIPPINES

Mekaela Ann Lieze M. Bajeta¹ and John Kenneth T. Malilay^{1*}

ABSTRACT

The study aimed to assess the awareness, behavior, and perception toward probiotic dairy products among Filipino consumers in Oriental Mindoro, Philippines. Using convenience sampling, the study surveyed a total of 367 milk consumers. The results showed that the majority of the participants were completely aware of the concept of probiotics. Furthermore, most of them consumed probiotic yogurt and yogurt drinks, citing supermarkets as their preferred place for purchasing these products. The study also revealed that consumers prioritized flavor and aroma over the appearance and mouthfeel of probiotic dairy products. Health benefits, nutritive value, and sensory quality were the main factors considered by consumers when purchasing such products. Most participants perceived probiotic dairy products as expensive but also viewed them as safer, healthier, more nutritious, and of better sensory quality compared to regular dairy products. Consequently, more than half of the respondents expressed a willingness to incorporate probiotic dairy products into their regular diet. Additionally, the study found that consumer perceptions of probiotic dairy products—excluding those related to product safety—were associated with respondents' sociodemographic and health profiles. The findings of this study could help local manufacturers develop effective marketing strategies that align with the consumption and purchase behaviors of consumers.

Keywords: consumer awareness, consumer behavior, consumer perception, probiotic dairy products, probiotics

INTRODUCTION

Probiotics include a variety of microbes such as bacteria, yeast, and molds. Among these microorganisms, the most widely used probiotics belong to the genera *Lactobacillus* (e.g., *L. acidophilus*, *L. rhamnosus*, *L. bulgaricus*, *L. reuteri*, *L. casei*), *Bifidobacterium*, and *Saccharomyces* (Krigler and Cohrssen, 2008). They can be administered through dietary supplements and pharmaceuticals, or they can be supplied through food as supplements or additives (Sanders *et al.*, 2018; Hansen, 2014). There are certain foods, however, that naturally contain probiotic microorganisms, such as yogurt, fermented milk, kimchi, sauerkraut, pickles, shoyu, miso, natto, and tempeh (Swain *et al.*, 2014; Homayouni *et al.*,

¹Institute of Animal Science, College of Agriculture and Food Science, University of the Philippines Los Baños, College, Los Baños 4031 Laguna, Philippines (*email: jtmalilay@up.edu.ph)

2012; Murooka and Yamshita, 2008). Among these products, yogurt and fermented milk have been popular vehicles for probiotics in the market today (Khorshidian *et al.*, 2020; Gómez-Gallego *et al.*, 2018). In the dairy industry, probiotics are frequently used as starters (either as monocultures or in combination with traditional starter cultures) or incorporated into dairy products following fermentation. Some strains can also be used to improve the functional characteristics of dairy products such as aroma, taste, and textural characteristics (Gao *et al.*, 2021).

Regular consumption of dairy products supplemented with probiotics has been shown to have beneficial effects against several diseases, such as respiratory tract infections (Rashidi *et al.*, 2021), cardiovascular diseases (Zhang *et al.*, 2020), diabetes (Ostadrahimi *et al.*, 2015), and gastrointestinal diseases (Mazahreh and Ershidat, 2009). The exact mechanisms of action responsible for these health benefits have not yet been fully understood. However, several mechanisms have been proposed, including bacteriocin and short-chain fatty acid production, lowering of gut pH, nutrient competition, stimulation of mucosal barrier function, and immunomodulation. Moreover, the health effects displayed by probiotics have been recognized to be strain-specific (Kechagia *et al.*, 2013). Hence, different microbial strains would exhibit different effects on human health and well-being.

Despite numerous scientific studies highlighting the health benefits of probiotics, many consumers remain unaware of their advantages. This lack of awareness may negatively impact consumers' purchasing and consumption decisions regarding probiotic products. Currently, there is limited research on the factors influencing Filipino consumers' buying behavior and perceptions of probiotic foods, particularly dairy products. Given this context, Oriental Mindoro was selected as the study site due to its status as an emerging agricultural hub with significant potential for dairy development. The province is located on the eastern side of the island, approximately 140 km southwest of Manila. It consists of 14 municipalities and one component city, with Calapan City serving as the capital and the only city in the region (Villarica, 2021). Recently, the province received a shipment of Anglo-Nubian dairy goats from the National Dairy Authority (Moaje, 2023). This initiative seeks to strengthen local dairy production and foster greater interest in dairy products, including probiotic options. Therefore, in support of this initiative, this study aimed to assess the awareness, buying behavior, and perception toward probiotic dairy products among Filipino consumers in Oriental Mindoro, Philippines.

MATERIALS AND METHODS

An online cross-sectional survey using non-probability sampling was conducted to assess the consumers' knowledge and dietary practices towards probiotic dairy products in Oriental Mindoro, Philippines. Convenience sampling was used to select potential respondents. The inclusion criteria were: (1) Filipino (ages 15 years old up to 64); (2) Residing in Oriental Mindoro, Philippines at the time of the survey; (3) Regular consumer of milk and milk products; and (4) Internet users. Potential respondents were contacted via electronic mail, social networking sites, and/or through instant online messaging applications.

Participation in this survey was voluntary. Each eligible participant provided an online consent form to indicate their willingness to participate. There were no incentives, monetary or otherwise, for taking part in the survey, and participants were free to withdraw at any time. To ensure anonymity, unique codes were assigned to each respondent. All data

and personal identities were kept strictly confidential.

The online questionnaire was designed to gather information on respondents' health status and socio-demographic profiles, including age, sex assigned at birth, place of residence, civil status, educational attainment, employment status, average monthly income, and household size. It also aimed to assess awareness of probiotics, consumption, and purchase behavior, and perceptions towards probiotic dairy products. The questionnaire, written in English, consisted of 26 questions utilizing various formats, including dichotomous, multiple-choice, ordinal, interval, and ratio scales. A 5-point Likert scale was used to assess various data, including quality, frequency, awareness, and familiarity. Before the official survey, the questionnaire was pre-tested to evaluate the validity of the questions. Necessary adjustments were made based on feedback from the pre-test respondents.

The sample size was calculated based on the working-age population (15 to 64 years old) in Oriental Mindoro, Philippines. Based on the 2020 Census of Population and Housing (CPH), Oriental Mindoro has a total population of 908,339 as of May 1, 2020 (PSA, 2021). Since there is no data regarding the proportion of residents aged 15 to 64 years old in the 2020 record, the 2015 CPH records were used instead. In 2015, the working-age group (15 to 64 years) comprised 60.58% of the household population in Oriental Mindoro (PSA, 2018). The minimum sample size was estimated using the Cochran Formula (Cochran, 1963). Considering a confidence interval of 95%, a proportion of 60.58%, and a level of precision of 5 percent, the final sample size calculated was $n_0 = 367$.

$$n_0 = \frac{Z^2 pq}{e^2}$$

where:

n_0 = sample size

Z = confidence level (Z value)

p = estimated proportion of the population that has the attribute in question

$q = 1 - p$

e = desired level of precision (i.e., margin of error)

All data were analyzed using the SAS® OnDemand for Academics (SAS Institute Inc., Cary, NC) software. Categorical and ordinal data were expressed as frequencies and percentages. The frequency (f) was computed by counting the number of times each value occurs in the data, whereas the percentage (%) was calculated by taking the frequency in the category divided by the total number of participants and multiplying by 100%. Spearman's Correlation analysis was used to determine the association between each of the variables of the socio-demographic profile of the respondents and their perceptions of probiotic dairy products. The Spearman's rank correlation coefficient (ρ) was calculated as follows:

$$\rho = 1 - \left[\frac{6 \sum d_i^2}{n (n^2 - 1)} \right]$$

where:

ρ = Spearman's rank correlation coefficient

d_i = Difference between the two ranks of each observation

n = Number of observations

RESULTS AND DISCUSSION

Socio-Demographic Profile of the Respondents

The socio-demographic profile of the respondents is summarized in Table 1. A total of 367 respondents participated in the study. Most of the respondents were female, single, and students. The dominant age group with the highest respondents was 20 to 24 years old, while the age group with the least number of respondents was 55 to 59 years old. Most of the respondents had a formal education, mainly secondary (49.32%) and tertiary education (32.15%). Around 44.96% belong to the lower middle class or those earning between P21,194 and P43,828 a month. The study covered 13 municipalities in Oriental Mindoro, with the most participants coming from Pinamalayan, Calapan, and Socorro.

Health Status of the Survey Respondents

Table 2 presents the health status of the survey respondents. Most of them rated their current physical health as either average or somewhat good, while only a small number rated it as poor or somewhat poor. The majority of respondents (74.11%) had a normal body weight, while 20.16% were classified as underweight and 5.72% were categorized as overweight or obese. A small proportion of participants (n=31) reported having various health conditions, such as allergies/intolerances (58.06%), respiratory problems (16.13%), hypertension (9.68%), diabetes (6.45%), gastritis (3.23%), liver problems (3.23%), and anemia (3.23%). Some of these individuals are currently taking medications, including antihypertensives, antihypotensives, anti-gastritis drugs, Cetirizine, and Salmeterol + Fluticasone propionate. Additionally, some respondents indicated regular intake of dietary supplements, with multivitamins (60.00%) being the most common, followed by vitamin C (48.00%), collagen (8.00%), and iron (4.00%). The results also revealed that the majority of respondents were non-smokers and non-alcohol drinkers.

Respondents' Awareness and Familiarity with Probiotics

Respondents' awareness of probiotics was evaluated using a 5-point Likert scale (Table 3). A significant proportion of participants (45.78%) reported being only slightly aware of probiotics, while a small percentage (7.90%) indicated they were completely unaware of the concept. This suggests that most respondents had some prior knowledge of probiotics before taking the survey. When asked to select the best definition of probiotics, more than half of the respondents correctly identified the FAO/WHO definition. According to FAO/WHO (2001), probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit to the host. This supports the earlier result showing that most respondents had a basic understanding of probiotics. Previous studies have similarly demonstrated that a majority of respondents are familiar with the concept of probiotics (Upasana *et al.*, 2024; Patait *et al.*, 2022; Mejia *et al.*, 2019).

Meanwhile, 38.96% chose an incorrect definition, and 5.72% were unsure of the correct answer. Respondents were also asked about their familiarity with the microorganisms commonly used as probiotics. The majority reported being only slightly familiar (37.87%) with the various probiotic strains, while others indicated varying levels of familiarity, ranging from moderate to extreme. Around 20.71% of respondents said they were completely unfamiliar with these microorganisms. Among the probiotic strains listed, most respondents stated being most familiar with *Lactobacillus paracasei* (49.86%), *Lactobacillus casei*

(44.96%), and *Lactobacillus delbrueckii* spp. (34.33%). The genus *Lactobacillus* is the largest and most diverse group of lactic acid bacteria, encompassing 168 different species.

Table 1. Socio-demographic profile of respondents in Oriental Mindoro.

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE (%)
Gender (n=367)	Male	178	48.50
	Female	189	51.50
Age Groups (n=367)	15 to 19	88	23.98
	20 to 24	136	37.06
	25 to 29	50	13.62
	30 to 34	28	7.63
	35 to 39	18	4.90
	40 to 44	8	2.18
	45 to 49	10	2.72
	50 to 54	15	4.09
	55 to 59	6	1.63
Education Level (n=367)	60 and above	8	2.18
	Elementary graduate	65	17.71
	Highschool graduate	181	49.32
	College graduate	118	32.15
	Post-graduate studies	2	0.54
	Graduate of a techno-vocational	1	0.27
Employment Status (n=367)	Student	171	46.59
	Government employee	22	5.99
	Private company employee	61	16.62
	Self-employed	71	19.35
	Retired	2	0.54
	Unemployed	40	10.90
Household Income (n=367)	Less than ₱10,957	36	9.81
	Bet. ₱10,957-₱21,194	86	23.43
	Bet. ₱21,194-₱43,828	165	44.96
	Bet. ₱43,828-₱76,669	63	17.17
	Bet. ₱76,669-₱131,484	14	3.81
	Bet. ₱131,484-₱219,140	2	0.54
	At least ₱219,140 up	1	0.27
Civil Status (n=367)	Single	262	71.39
	Married	70	19.07
	Widowed	5	1.36
	Separated	3	0.82
	In a cohabiting relationship	27	7.36

Table 2. Health status of respondents in Oriental Mindoro.

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Physical Health Rating (n=367)	Poor	1	0.27
	Somewhat Poor	35	9.54
	Average	189	51.50
	Somewhat Good	117	31.88
	Excellent	25	6.81
BMI Class (n=367)	Underweight	74	20.16
	Normal Weight	272	74.11
	Overweight	20	5.45
	Obese	1	0.27
Presence of Current Illness (n=367)	Yes	31	8.45
	No	336	91.55
Medication Intake (n=367)	Yes	7	98.09
	No	360	1.91
Dietary Supplementation (n=367)	Yes	342	93.19
	No	25	6.81
Smoking (n=367)	Never	308	83.92
	Very Rarely	20	5.45
	Rarely	18	4.90
	Occasionally	10	2.72
	Very Frequently	5	1.36
	Always	6	1.63
Alcohol Intake (n=367)	Never	201	54.77
	Very Rarely	74	20.16
	Rarely	42	11.44
	Occasionally	45	12.26
	Very Frequently	3	0.82
	Always	2	0.54

Many of which are used as probiotics in food or nutraceutical applications (Ibrahim, 2016). Recently, multiple strains have been identified as possessing potential probiotic properties, including *Lactobacillus acidophilus* BIOTECH 1900 (Malilay *et al.*, 2019) and various *Lactobacillus* strains isolated from traditional Filipino products. These strains were from Philippine rice wine, *tapuy* (Malilay *et al.*, 2024), and Filipino soft white cheese, *kesong puti* (Malilay *et al.*, 2022). *Lactobacillus paracasei* is one of the most commonly used strains in commercial probiotic dairy product preparations, such as yogurt, cheese, fermented milk, and ice cream (Stefanovic *et al.*, 2017).

Participants were also asked about their familiarity with probiotic-rich foods and food products. The majority were most familiar with yogurt (94.55%) and yogurt drinks (90.19%), which are widely recognized as primary vehicles for delivering probiotics to the body. Yogurt remains one of the most popular probiotic sources (Nyanzi *et al.*, 2021).

This aligns with previous studies, where the majority of participants identified yogurt as the primary source of probiotics (Alkhaldy, 2024; Islam *et al.*, 2022). Other products mentioned by respondents included cheese, kimchi, and cultured milk. Tempeh was the least recognized, which is not surprising given that it is not commonly included in the traditional Filipino diet. In general, participants were most familiar with probiotic dairy products. Many participants reported learning about probiotics through television (63.22%), which is not surprising given that television remains a primary source of information for many in the Philippines. With nearly every Filipino household owning a television, it serves as an accessible and widely trusted platform for health-related education and awareness. This entails that television could be an effective medium for reaching a large audience in order to raise awareness and disseminate information about probiotics to a broad audience.

Table 3. Awareness and Familiarity with Probiotics Among Respondents

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Respondents' Awareness of Probiotics	Not at all aware	29	7.90
	Slightly aware	168	45.78
	Somewhat aware	35	9.54
	Moderately aware	130	35.42
	Extremely aware	5	1.36
Definition of Probiotics According to Respondents	No idea at all	21	5.72
	Live microorganisms are used primarily to improve the physico-chemical properties of food	61	16.62
	Live microorganisms that, when administered in adequate amounts, confer a health benefit on the host	203	55.31
	Live microorganisms whose main function is to increase the efficiency of the food fermentation process	82	22.34
Respondents' Familiarity with Microorganisms Used as Probiotics	Not at all familiar	76	20.71
	Slightly familiar	139	37.87
	Moderately familiar	70	19.07
	Somewhat familiar	69	18.80
	Extremely familiar	13	3.54
Respondents' Familiarity with Probiotic-Rich Foods and Food Products	Acidophilus	58	15.80
	Cultured milk	172	46.87
	Fermented fish	68	18.53
	Fermented meat	82	22.34
	Kefir	29	7.90
	Kimchi	201	54.77
	Miso	122	33.24
	Natto	34	9.26
	Pickles	146	39.78

Table 3 Continuation...

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Respondents' Familiarity with Probiotic-Rich Foods and Food Products	Probiotic ice cream	112	30.52
	Probiotic cheese	222	60.49
	Sauerkraut	34	9.26
	Sourdough bread	84	22.89
	Tempeh	16	4.36
	Traditional buttermilk	78	21.25
	Yogurt	347	94.55
	Yogurt drink	331	90.19
Sources of Information Regarding Probiotics Among Respondents	Education	200	54.50
	Family	227	61.85
	Friends	183	49.86
	Online advertisements	141	38.42
	Printed publications	150	40.87
	Radio	14	3.81
	Social media	222	60.49
	Television	232	63.22
	Work	70	19.07

Consumption and Purchasing Behavior of Respondents

A small proportion of respondents (n=36) reported not consuming probiotic dairy products (Table 4). The main barriers cited included the high cost (72.22%) and limited availability of such products (47.22%). Additional factors contributing to non-consumption included digestive concerns, such as lactose intolerance (16.67%), lack of awareness regarding the health benefits of probiotics (13.89%), and the availability of dairy alternatives (5.56%). In contrast, the majority of respondents (n=331) indicated that they do consume probiotic dairy products. For these consumers, the main reasons for consumption were the perceived nutritional value (69.18%), sensory quality (67.98%), and potential health benefits (65.26%). Most respondents (61.93%) reported consuming probiotic dairy products 2 to 3 times per week. These findings suggest a strong preference for probiotic dairy products among Filipino consumers in Oriental Mindoro, Philippines. Regarding purchasing habits, most respondents (70.57%) indicated that supermarkets were their preferred venue for buying probiotic dairy products. Similar results were observed in the study by Das *et al.* (2019), where supermarkets were the preferred location for purchasing probiotic yogurt, as well as probiotic buttermilk and probiotic lassi. Other notable purchasing locations included neighborhood sundry (*sari-sari*) stores and convenience stores. Fewer respondents reported buying probiotic dairy products from wet markets, online shops, or local dairy bars.

Yogurt (74.39%) and yogurt drinks (77.93%) emerged as the most favored probiotic dairy products. These products are typically made from milk fermented with *Streptococcus thermophilus* and *Lactobacillus delbrueckii* ssp. *bulgaricus* (Walstra *et al.*, 2005), with some varieties containing additional probiotic strains such as those from the genera *Lactobacillus* and *Bifidobacterium*. A smaller portion of respondents preferred powdered milk (40.87%) and

Table 4. Consumption and purchase behavior of respondents in Oriental Mindoro.

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Respondents' Consumption of Probiotic Dairy Products	No	36	9.81
	Yes	331	90.19
Weekly Frequency of Probiotic Dairy Product Consumption Among Respondents	Less than 1 time	13	3.93
	1 time	64	19.34
	2 to 3 times	205	61.93
	4 to 5 times	46	13.90
	6 or more times	3	0.01
	Less than 1 time	13	3.93
Respondents' Preferred Purchase Locations for Probiotic Dairy Products	Convenience stores	181	49.32
	Local dairy bar	6	1.63
	Online shops	55	14.99
	<i>Sari-sari</i> stores	207	56.40
	Supermarket	259	70.57
	Wet markets	42	11.44
Respondents' Preferred Types of Probiotic Dairy Products	Acidophilus	52	14.17
	Cultured milk	138	37.60
	Kefir	17	4.63
	Powdered milk	150	40.87
	Probiotic cheese	63	17.17
	Probiotic ice cream	76	20.71
	Traditional buttermilk	64	17.44
	Yogurt	273	74.39
Modes of Probiotic Dairy Product Consumption Among Respondents	Yogurt drink	286	77.93
	Added in cold drinks	211	57.49
	Added in desserts	142	38.69
	As a product on its own	258	70.30
Factors Considered by Respondents When Purchasing Probiotic Dairy Products	As dressing	31	8.45
	Advertisement/promotions	58	15.80
	Availability	202	55.04
	Brand and manufacturer	127	34.60
	Health benefits	257	70.03
	Nutritive value	217	59.13
	Packaging	22	5.99
	Price	165	44.96
	Product variety	44	11.99
	Safety	209	56.95
	Sensory quality	215	58.58

cultured milk (37.60%). Other selected probiotic dairy products included probiotic ice cream, traditional buttermilk, probiotic cheese, and *acidophilus* milk. Kefir, despite being one of the richest sources of probiotics, was found to be the least favored product among respondents, with only 4.63% indicating a preference for it. This fermented dairy beverage is known for its diverse microbial composition, harboring a range of beneficial microorganisms such as *Lactococcus*, *Lactobacillus*, *Leuconostoc*, *Acetobacter*, *Kluyveromyces*, and *Saccharomyces* (Youn *et al.*, 2023; Yilmaz *et al.*, 2022; Goktas *et al.*, 2021). Despite its notable health benefits, kefir remains relatively unpopular in the Philippines, suggesting potential barriers to its acceptance or consumption in this particular market. Table 4 also illustrates the various consumption methods of probiotic dairy products among respondents. The results revealed that the majority of respondents preferred consuming these products on their own (70.30%), while others incorporated them into cold drinks and beverages (57.49%). Health benefits emerged as the primary factor influencing respondents' decisions when purchasing probiotic dairy products, followed by nutritive value, sensory quality, safety, and availability. Other factors considered included brand, advertisements/promotions, product variety, and packaging. This highlights that consumers prioritize the health advantages these products offer over other attributes. Marketing probiotic dairy products as a healthier alternative to conventional options could resonate strongly with consumers, emphasizing their potential health benefits.

Respondents' Perceptions of Probiotic Dairy Products

Table 5 presents respondents' perceptions of probiotic dairy products. Most respondents recognized differences between probiotic and regular dairy products in terms of price, nutritive value, safety, health benefits, and sensory attributes. While probiotic dairy products were generally seen as more expensive, they were also perceived as safer, healthier, more nutritious, and of superior sensory quality compared to regular dairy products. When asked to rank the sensory attributes they considered most important, nearly half of the participants identified flavor as the most significant factor in their dairy product choice, underscoring its critical role in shaping consumer preferences. Aroma followed as the second most valued attribute, with appearance and mouthfeel, which ranked lowest.

Table 5. Perception of respondents on price and health benefits of probiotic dairy products.

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Price	Cheap	52	14.17
	Expensive	260	70.84
	No Difference with Regular Dairy Products	55	14.99
Nutritive Value	Less nutritious	9	2.45
	More nutritious	334	91.01
	No Difference with Regular Dairy Products	24	6.54
Safety	Unsafe	4	1.09
	Safe	344	93.73
	No Difference with Regular Dairy Products	19	5.18

Table 5 Continuation...

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Health Benefits	Less Beneficial to Human Health	13	3.54
	More Beneficial to Human Health	324	88.28
	No Difference with Regular Dairy Products	30	8.17
Flavor	Less flavorful	47	12.81
	More flavorful	247	67.30
	No Difference with Regular Dairy Products	73	19.89
Aroma	Weaker Aroma	105	28.16
	Stronger aroma	140	38.15
	No Difference with Regular Dairy Products	122	33.24
Mouthfeel	Poor mouthfeel	31	8.45
	Better Mouthfeel	234	63.76
	No Difference with Regular Dairy Products	102	27.79
Appearance	Less desirable	31	8.45
	More desirable	201	54.77
	No Difference with Regular Dairy Products	135	36.78

Willingness and Preferences of Respondents Regarding Probiotic Dairy Products

Driven by these positive perceptions, most respondents (66.49%) expressed a willingness to incorporate probiotic dairy products into their regular diets, with the majority willing to spend up to 100 pesos weekly on such products (Table 6). Conversely, 33.51% of respondents were not inclined to add probiotic dairy products to their diets, with price cited as the main deterrent (62.03%). This aligns with the perception of probiotic products as costlier than regular dairy products. Other reasons included limited availability, lack of awareness of health benefits, digestive issues (e.g., lactose intolerance), and the availability of alternative dairy options. A significant majority (95.37%) supported adding probiotics to various Philippine indigenous dairy products such as milk confectionery (*pastillas de leche*), traditional milk-based ice cream (*sorbetes*), soft white cheese (*kesong puti*), and milk jello (Table 6). This preference underscores the potential for probiotic dairy products to be successfully integrated into familiar and culturally significant food items, thus expanding the appeal and accessibility of probiotics within the Filipino dietary context. In the study by Kisworo *et al.* (2008), *Lactobacillus paracasei* subsp. *paracasei* was successfully incorporated into two traditional Filipino dairy products, *pastillas de leche* and *kesong puti*. Their findings indicated that the introduction of this probiotic strain not only enhanced product yield but also contributed to a more favorable nutritional profile, likely attributed to microbial activities during fermentation. Similarly, our previous study (Malilay *et al.*,

2022) has shown the effects of several locally isolated, potentially probiotic *Lactobacillus* strains as starter cultures in the fermentation of cow, goat, and buffalo milk. The study revealed that fermentation with these strains significantly elevated the antioxidant activity of the milk, suggesting added health benefits derived from increased levels of bioactive compounds generated by the probiotic bacteria during the fermentation process. These studies collectively underscore the viability of probiotic fortification in such local dairy products.

Table 6. Willingness and preferences of respondents regarding probiotic dairy products.

PARAMETERS	CHARACTERISTICS	FREQUENCY	PERCENTAGE
Willingness to Include Probiotic Dairy Products in Regular Diet	No	123	33.51
	Yes	244	66.49
Weekly amount Willing to Spend on Probiotic Dairy Products by Respondents	0 to 100 pesos	107	43.85
	101 to 200 pesos	78	21.25
	201 to 300 pesos	30	8.17
	301 to 400 pesos	17	4.63
	401 to 500 pesos	8	2.18
	501 to 700 pesos	1	0.27
	1001 pesos and above	3	1.23
Willingness to Incorporate Probiotics into Indigenous Dairy Products by Respondents	No	17	4.63
	Yes	350	93.57
Preferred Indigenous Dairy Products to be Added with Probiotics by Respondents	<i>Kesong puti</i>	217	25.99
	Milko-Jel	124	14.85
	<i>Pastillas de Leche</i>	248	29.70
	Traditional <i>Sorbetes</i>	246	29.46

Factors Influencing Perception of Probiotic Dairy Products

No significant association was established between respondents’ socio-demographic profiles or health status and their perception of the safety of probiotic dairy products (Table 7). However, perceptions regarding the price, nutritive value, health benefits, flavor, aroma, mouthfeel, and appearance of probiotic dairy products were significantly correlated with respondents’ socio-demographic profiles and health status. Specifically, the level of education, income, and health status of the respondents influenced consumers’ perception of price. The level of education and health status of the respondents had a very weak positive relationship with the perception of price, whereas income had a weak positive relationship. These weak to very weak correlations suggest that while demographic and personal factors do have some influence on how consumers perceive prices, their overall impact is quite limited. Generally, people who are more educated, healthier, or have higher incomes might view prices a bit more positively. But because the connections are weak, it’s likely that other factors also play a big role in shaping how consumers see prices.

Table 7. Correlation between Socio-Demographic Profile and Respondents' Perception Regarding Probiotic Dairy Products.

		Sex	City/ Municipality	Age Group	Civil Status	Educational Attainment	Employment Status	Monthly Income	Health Status
Price	Correlation Coefficient	0.025	-0.038	0.101	-0.043	0.167**	0.099	0.256**	0.187**
	Sig. (2-tailed)	0.613	0.594	0.053	0.414	0.001	0.058	<.0001	0.0003
Nutritive Value	Correlation Coefficient	-0.052	-0.014	0.074	-0.052	0.151**	0.129*	0.029	0.112*
	Sig. (2-tailed)	0.321	0.792	0.155	0.323	0.004	0.013	0.583	0.033
Safety	Correlation Coefficient	0.005	-0.012	-0.008	-0.054	0.034	0.085	-0.012	0.098
	Sig. (2-tailed)	0.922	0.817	0.882	0.301	0.522	0.102	0.815	0.060
Health Benefits	Correlation Coefficient	-0.063	-0.102	0.017	-0.058	0.143**	0.046	0.117*	0.082
	Sig. (2-tailed)	0.231	0.052	0.739	0.271	0.006	0.379	0.025	0.119
Flavor	Correlation Coefficient	-0.001	-0.033	0.205**	0.185**	0.052	0.153**	0.006	0.012
	Sig. (2-tailed)	0.988	0.522	<.001	.0004	0.319	0.003	0.915	0.816
Aroma	Correlation Coefficient	0.734	0.0134	0.214**	0.127*	0.105*	0.189**	0.028	0.000
	Sig. (2-tailed)	0.158	0.790	<.001	0.015	0.045	0.000	0.598	0.995
Mouthfeel	Correlation Coefficient	0.17*	0.003	0.263**	0.163**	0.123*	0.210**	0.005	0.016
	Sig. (2-tailed)	0.041	0.956	<.001	0.002	0.019	<.001	0.930	0.765
Appearance	Correlation Coefficient	0.145**	-0.056	-0.152**	-0.086*	0.121*	0.252**	0.104*	0.034
	Sig. (2-tailed)	0.006	0.289	<.001	0.028	0.020	<.001	0.047	0.515

*Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

In contrast, consumers' perception of nutritive value toward probiotic dairy products was significantly correlated with the level of education, employment status, and health status. These findings suggest that individuals with higher educational attainment, active employment, and better health conditions are more likely to recognize and appreciate the nutritional benefits of probiotic dairy products. This may be attributed to increased health literacy and greater access to nutrition-related information among these groups.

Only two variables (education level and income) were found to be significantly correlated with regard to the perception of consumers toward the health benefits of probiotic dairy products. This implies that individuals who are more educated, or those with higher incomes, may have greater access to health information and are more likely to appreciate the

preventive and therapeutic value of probiotics.

Furthermore, the perception of sensory quality, encompassing flavor, aroma, mouthfeel, and appearance, was significantly influenced by a broader set of socio-demographic variables, including sex, age, civil status, level of education, and employment status. This indicates that sensory preferences and expectations may vary considerably across different population segments, with potential implications for product development and marketing strategies. Understanding demographic-driven differences in the perception of probiotic dairy products is crucial for tailoring offerings that align with consumer expectations and boost overall acceptance.

CONCLUSION

This study offers valuable insights into the awareness, behaviors, and perceptions of selected Filipino consumers regarding probiotic dairy products. In general, the consumers demonstrated an awareness of probiotics, reported regular consumption of probiotic yogurts and yogurt drinks, and expressed willingness to integrate probiotic dairy products into their regular diet. These findings can serve as a guide for local manufacturers to develop targeted marketing strategies that resonate with consumer priorities, such as health benefits, nutritive value, and sensory quality, thus fostering greater demand for probiotic dairy products in the region. Additionally, the study highlights the potential for fortifying indigenous Filipino dairy products with probiotics. Such innovations could play a crucial role in enhancing the nutritional value and health benefits of traditional dairy products. By aligning product development with consumer preferences, there is an opportunity to not only improve public health but also boost the growth and sustainability of the local dairy industry.

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