

Analysis of Malaysian consumers' awareness on probiotics in fresh milk and its nutritional health

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Abstract

In a developing country like Malaysia, consumers tend to be concerned about healthy products as it enhances the functional and health benefits of consumers. Lactic Acid Bacteria (LAB) plays an important role in giving nutritional health to fresh milk products as it contains probiotic strains. Examples of probiotic bacteria include *Lactobacillus acidophilus*, *Bifidobacterium bifidum*, and *Lactobacillus rhamnosus*. Currently, fresh milk product demand is increasing in the market, the consumers need to be aware of the existence of probiotics in fresh milk products as well as their beneficial impacts. Thus, an analysis is required to understand consumers' knowledge about probiotics and their perception towards fresh milk products. The data was investigated among randomly selected 170 consumers in Malaysia. A structured online questionnaire was distributed through social media and conducted via google form as a part of data collection. The data were analyzed using IBM SPSS software. Descriptive analysis and Chi-square test were used to identify the significant differences with a p-value of < 0.05 between socio-demographic profiles with awareness, knowledge and perceptions towards probiotics and fresh milk. The findings showed that more than 80% of consumers in Malaysia have higher awareness, knowledge and positive perceptions toward probiotics in fresh milk.

1. Introduction

In most developing countries, milk is produced by smallholders, and milk production contributes to household livelihoods, food security and nutrition in several Southeast Asian countries including Malaysia (Shahudin *et al.*, 2018). In the food industry, probiotics which commonly come from a group of lactic acid bacteria (LAB) are usually found in fresh milk (Perera and Weerasooriya, 2019). Fresh milk is consumed as raw and processed in daily nutrition (Uzundumlu, 2019). Probiotics are defined as live microorganisms that provide beneficial effects on their hosts' health when ingested in an adequate amount as reported by Food and Agriculture Organizations and the World Health Organization (Chen *et al.*, 2020). Examples of probiotics include *Lactobacillus* sp., *Streptococcus* sp., and *Enterococcus* sp. (Roobab *et al.*, 2020). Probiotics have many positive impacts on human health including alteration of gut microbiota balance, inhibition of harmful pathogens growth, and promotion of decent digestion such as alleviating lactose intolerance, increasing of immune system and resistance to infection

(Bhuiyan *et al.*, 2017).

Lactic acid bacteria (LAB) are Gram-positive, non-spore-forming and catalase-negative bacteria that produce lactic acid used for the process of fermentation, especially in dairy products. The production of lactic acid can give better flavour, aroma and texture formation in milk products including fresh milk (Rahman, 2015). Examples of genera of LAB are *Lactobacillus*, *Bifidobacterium* and *Lactococcus* (Muryany *et al.*, 2017). Some LABs are natural components of the gastrointestinal microflora and produce components such as hydrogen peroxide and bacteriocin which can inhibit the growth of pathogens in foods that can lead to diarrheal diseases (Eid *et al.*, 2016). Due to their contribution to human health as nutritional supplements for building up the intestinal microbiota, some LABS are used as probiotics.

Even though there are a lot of different studies proving that probiotics provide many benefits to human health, there is still a lack of clear information about the

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existence of probiotics in fresh milk among Malaysian consumers. This survey will be important to the food quality and safety industry to ensure the consumers' safety by providing healthy milk without affecting consumers' health. Hence, the objectives of this study are to investigate the knowledge of consumers about the nutritional health of probiotics in fresh milk and to analyze consumers' perception and willingness to purchase probiotic products based on socio and demographic characteristics.

2. Materials and methods

2.1 Data collection

As part of data collection, a structured online questionnaire via google form was spread through social media such as WhatsApp, Facebook and Instagram (Sahib *et al.*, 2016). The data was collected for two weeks starting from the end of March 2021 to the beginning of April 2021. The survey was needed to understand the effect of sociodemographic profile on awareness about probiotics, knowledge and consumption patterns of fresh milk products among respondents. The survey questionnaire was divided into three sections (Section One: respondent profiler, Section Two: respondent awareness and knowledge about probiotics, and Section Three: consumer perceptions towards fresh milk products). The survey questionnaire was distributed in the Malay language. The first section of the survey was based on socio-demographic profiles of respondents including age, gender, educational level, employment status, demographic area and health status (Arora *et al.*, 2021). The survey had a single answer, multiple choices and checkboxes.

2.2 Respondents

The survey was randomly distributed among Malaysian consumers (Rijkers *et al.*, 2013) which targeted 170 respondents. The respondents were needed to answer the questionnaire based on their socio-demographic background. After the survey had reached the target number of respondents which was 170, the survey was closed and no longer accepted responses. Only 138 out of 170 respondents were valid to be used in this study.

2.3 Statistical analysis

The data were statistically analyzed using IBM Statistical Package for Social Sciences, SPSS version 20 and Microsoft Office Excel 365. The descriptive statistical method and Chi-Square test were performed to identify the relationship between consumers' attitudes toward probiotics and their knowledge. To test the independence in cross-tabular data, p-value < 0.05 was considered statistically a significant difference (Arora *et al.*, 2021).

3. Results and discussion

3.1 Awareness and knowledge about probiotics and fresh milk

From this study, the majority of respondents were aware of the term probiotics (87%), knew about the existence of probiotics in fresh milk (80.4%) and the benefits of fresh milk (92%) as shown in Table 1. From this data, the relationship between respondents' socio-demographic profiles with awareness of the term 'probiotic' (Table 2), knowledge about the existence of probiotics in fresh milk (Table 3) and knowledge about the benefits of fresh milk (Table 4) was further determined using Chi-square test. From Table 2, the results showed that there was higher awareness from female respondents (87.9%) compared to male (84.8%) respondents. This is because females are more interested in their physical appearance and health to comply with dietary guidelines compared to males (Asma'a *et al.*, 2018). However, there are no significant differences between gender and awareness about the term 'probiotic' because the p-value = 0.680 > 0.05 similar to the previous study by Soni *et al.* (2018). Only age, demographic area and educational level showed significant differences with awareness about the term 'probiotic' because p-values are lower than 0.05 (Table 2).

When asked about the definition of probiotics, results in Figure 1 showed that only 81.9% of respondents answered correctly, that probiotic is defined as live microorganisms although 87% of them answered that they were aware of the term probiotic in Table 1. In this regard, there is a study by Khalesi *et al.* (2020) about

Table 1. Awareness and knowledge about probiotics and fresh milk.

| Variables | Responses | Frequency (n = 138) | Percentage (%) |
|---|-----------|---------------------|----------------|
| Awareness on the term Probiotic | Yes | 120 | 87.0 |
| (Do you ever heard about the term 'probiotic?') | No | 18 | 13.0 |
| Knowledge about Existence of Probiotics in Fresh Milk | Yes | 111 | 80.4 |
| (Do you know that fresh milk contains probiotic bacteria that are good for health?) | No | 27 | 19.6 |
| Knowledge about Benefits in Fresh Milk | Yes | 127 | 92.0 |
| (Do you know about any nutritional health in fresh milk?) | No | 11 | 8.0 |

Table 2. Chi-square analysis between socio-demographic profiles and awareness of the term ‘probiotic’.

| Variables | Socio-demographic profile | Total (n = 138) | Awareness on term ‘probiotic’ | | p-value |
|-------------------|------------------------------------|--------------------|-------------------------------|--------|---------|
| | | | Yes (%) | No (%) | |
| Gender | Male | 33 | 84.8 | 15.2 | 0.680 |
| | Female | 105 | 87.6 | 12.4 | |
| Age | Below 18 | 2 | 0.0 | 100.0 | 0.000 |
| | 18-24 | 91 | 93.4 | 6.6 | |
| | 25-34 | 11 | 54.5 | 45.5 | |
| | 35-44 | 27 | 81.5 | 18.5 | |
| | Above 45 | 7 | 100.0 | 0.0 | |
| Demographic Area | City | 85 | 91.8 | 8.2 | 0.034 |
| | Rural | 53 | 79.2 | 20.8 | |
| Educational Level | SPM and below | 24 | 62.5 | 37.5 | 0.003 |
| | Matriculation/Foundation/Form 6 | 30 | 93.3 | 6.7 | |
| | Bachelor’s degree | 78 | 91.0 | 9.0 | |
| | Master | 3 | 100.0 | 0.0 | |
| | PhD/Professional | 3 | 100.0 | 0.0 | |
| Employment Status | Employed (in health field) | 12 | 100.0 | 0.0 | 0.065 |
| | Employed (not in the health field) | 34 | 76.6 | 23.5 | |
| | Unemployed | 92 | 87.0 | 13.0 | |
| Health Status | Yes | 21 | 81.0 | 19.0 | 0.375 |
| | No | 117 | 88.0 | 12.0 | |

Australian adults’ awareness and attitudes towards gut health, probiotics and prebiotics. They reported that most of the respondents’ probiotic consumption was influenced by personal knowledge and beliefs (39.3%), followed by getting a recommendation from a health professional (26.1%) and lastly influenced by family and friend’s suggestions (20.1%).

Contrast results showed that respondents from the rural area had the highest percentages of knowledge of the benefits of fresh milk (96.2%) compared to city areas (89.4%) (Table 4). This is probably due to most rural areas in developing countries raising animals such as goats and cows to produce large-scale milk (Idamokoro, *et al.*, 2019). Hence, most consumers in rural areas knew about the beneficial effects of fresh milk.

In your opinion, what is probiotic?

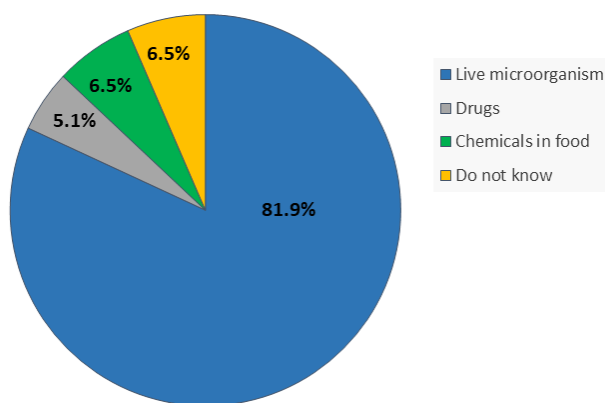


Figure 1. Pie chart of respondents’ knowledge on the definition of probiotics.

Other than that, the result showed that the higher the educational level, the higher the knowledge about the existence of probiotics in fresh milk (Table 3). This result is in agreement with the study by Pradito *et al.* (2020) where their study is to determine the knowledge and perception of probiotics by Jabodetabek college students in Indonesia. The results showed many of the college students had basic knowledge about probiotics.

3.2 Perceptions toward safety and benefits of probiotics in human health

From Table 5, the majority of respondents had positive perceptions toward the safety of probiotics (90.6%) and the benefits of probiotics in human health (83.3%). According to Santacroce *et al.* (2019), safety in probiotics can be guaranteed when they belong to the bacterial group labelled as Generally Regarded As Safe (GRAS) and gain Qualified Presumption of Safety (QPS) status defined by the European Food Safety Authority Scientific Committee (EFSA). However, some 9.4% of respondents are still unsure about the safety of probiotics (Table 5). This is due to uncertainties towards probiotics since there is still a lack of sufficient evidence on the probiotic effects and its mechanism of action in the human body (Mejia *et al.*, 2019). Health status influences good perceptions toward probiotic in human health probably because consumers like to consume probiotics to solve the problem of low physical activity and individuals who face illnesses before tends to practice disease-preventive eating habits (Yilmaz-Ersan *et al.*, 2020). However, there were 2.2% of respondents who answered ‘No’ and 14.5% who were still unsure

Table 3. Chi-square analysis between socio-demographic profiles and consumers' knowledge about the existence of probiotics in fresh milk.

| Variables | Socio-demographic profile | Total (n = 138) | Knowledge about existence of probiotics in fresh milk | | p-value |
|-------------------|------------------------------------|--------------------|--|--------|---------|
| | | | Yes (%) | No (%) | |
| Gender | Male | 33 | 75.8 | 24.2 | 0.437 |
| | Female | 105 | 81.9 | 18.1 | |
| Age | Below 18 | 2 | 0.0 | 100.0 | 0.000 |
| | 18-24 | 91 | 85.7 | 14.3 | |
| | 25-34 | 11 | 45.5 | 54.5 | |
| | 35-44 | 27 | 77.8 | 22.2 | |
| | Above 45 | 7 | 100.0 | 0.0 | |
| Demographic Area | City | 85 | 77.6 | 22.4 | 0.296 |
| | Rural | 53 | 84.9 | 15.1 | |
| Educational Level | SPM and below | 24 | 70.8 | 29.2 | 0.320 |
| | Matriculation/Foundation/Form 6 | 30 | 73.3 | 26.7 | |
| | Bachelor's degree | 78 | 84.6 | 15.4 | |
| | Master | 3 | 100.0 | 0.0 | |
| | PhD/Professional | 3 | 100.0 | 0.0 | |
| Employment Status | Employed (in health field) | 12 | 91.7 | 8.3 | 0.357 |
| | Employed (not in the health field) | 34 | 73.5 | 26.5 | |
| | Unemployed | 92 | 81.5 | 18.5 | |
| Health Status | Yes | 21 | 71.4 | 28.6 | 0.259 |
| | No | 117 | 82.1 | 17.9 | |

Table 4. Chi-square analysis between socio-demographic profiles and consumers' knowledge about the benefits of fresh milk.

| Variables | Socio-demographic profile | Total (n = 138) | Knowledge about existence of probiotics in fresh milk | | p-value |
|-------------------|------------------------------------|--------------------|--|--------|---------|
| | | | Yes (%) | No (%) | |
| Gender | Male | 33 | 87.9 | 12.1 | 0.313 |
| | Female | 105 | 93.3 | 6.7 | |
| Age | Below 18 | 2 | 0.0 | 100.0 | 0.000 |
| | 18-24 | 91 | 93.4 | 6.6 | |
| | 25-34 | 11 | 81.8 | 18.2 | |
| | 35-44 | 27 | 96.3 | 3.7 | |
| | Above 45 | 7 | 100.0 | 0.0 | |
| Demographic Area | City | 85 | 89.4 | 10.6 | 0.151 |
| | Rural | 53 | 96.2 | 3.8 | |
| Educational Level | SPM and below | 24 | 87.5 | 12.5 | 0.703 |
| | Matriculation/Foundation/Form 6 | 30 | 96.7 | 3.3 | |
| | Bachelor's degree | 78 | 91.0 | 9.0 | |
| | Master | 3 | 100.0 | 0.0 | |
| | PhD/Professional | 3 | 100.0 | 0.0 | |
| Employment Status | Employed (in health field) | 12 | 100.0 | 0.0 | 0.566 |
| | Employed (not in the health field) | 34 | 91.2 | 8.8 | |
| | Unemployed | 92 | 91.3 | 8.7 | |
| Health Status | Yes | 21 | 90.5 | 9.5 | 0.776 |
| | No | 117 | 82.1 | 17.9 | |

Table 5. Perceptions toward safety and benefits in probiotics in human health.

| Variables | Responses | Frequency (n = 138) | Percentage (%) |
|--|-------------|---------------------|----------------|
| Perception towards Safety of Probiotic (Do you think probiotic is safe to consume?) | Yes | 125 | 90.6 |
| | No | 0 | 0.0 |
| | Do not know | 13 | 9.4 |
| Perception towards Probiotic in Human Health (Do you think probiotic able to improve human health?) | Yes | 115 | 83.3 |
| | No | 3 | 2.2 |
| | Do not know | 20 | 14.5 |

whether probiotics could improve human health or not (Table 5). This may be due to the consumers' initial ignorance about probiotics and does not believe the health claims on food labels (Macouzet, 2012).

3.3 Sources of information about probiotic

From Figure 2, respondents who come from the age group eighteen to twenty-four had the highest level of awareness as most of them gained information about probiotics from the most popular sources which are advertisements (49.3%), internet (47.1%) and school (26.8%). Most of the respondents which is 66.7% gained information about probiotics from advertisements through electronic mediums such as television, radio or social media. This result is similar to the study of Sharma *et al.* (2019) where the majority of students (39.41%) had become aware of the existence of probiotics through electronic media advertisements since this method educates consumers and encourages them to try their product. This explained why most people from age eighteen to twenty-four had a higher level of awareness regarding probiotics since they were more exposed to social media. However, there was also 8.0% of the respondents who did not have any information regarding probiotics. Hence, more exposure to probiotics should be done through various platforms to increase awareness and knowledge level of probiotics.

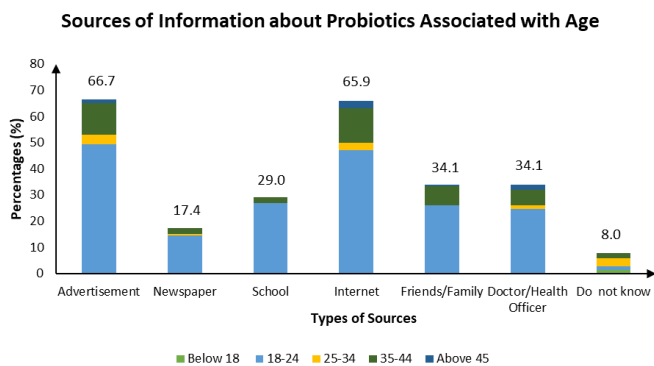


Figure 2. Bar chart of respondents' sources of information linked with age.

3.4 Consumption and behaviour towards probiotic products

Further questions were asked to analyze consumers' consumption and behaviour toward probiotic products. The questions involved consumers' preferences on probiotic products, types of probiotic products usually consumed, frequency of probiotic consumption and reasons for taking probiotic products. Descriptive analysis was used in the results data. Figure 3 shows that most of the respondents like to consume probiotic products which contributed to 115 (83.35) from the total sample size of respondents (n = 138). Only a few of them did not prefer to consume probiotic products. When

asked about the type of products that consumers usually consume, the majority of them (40.6%) chose fresh milk. This was followed by yoghurt at 39.1%, fermented food with 15.2% and capsule with 5.0%. The reason why most of the respondents chose fresh milk is probably because of the rising incomes and awareness of the nutritional benefits of milk linked with change of taste of preference among Malaysian consumers which contributed to the growing demand for fresh milk (Suntharalingam, 2019).

Do you like to consume probiotic product?

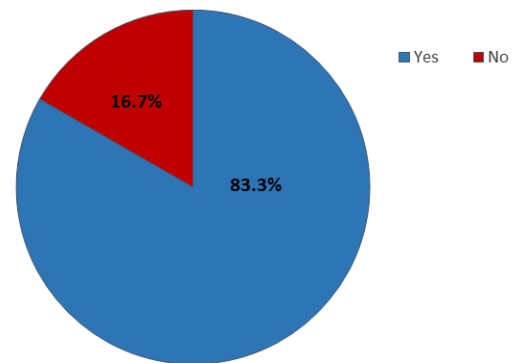


Figure 3. Pie chart of consumers' preferences on probiotic products.

From the data collected, half of the consumers consumed probiotics once a week at 50.0%. The second highest frequency of probiotics consumption is seldom (20.3%), followed by once a month at 19.6% and daily consumption at 10.1%. This correlated with a study from Pradito *et al.* (2020) where the previous consumption of probiotic products by most respondents was less than two weeks.

When asked about the reason for taking probiotics, most of the consumers, 61.6% answered that they took probiotics to improve the digestive system. The second highest reason is that probiotic products are delicious (31.0%) followed by preventing disease (4.3%), and to reduce allergic (2.25%). The remaining reason was the lack of reason to consume probiotic products. These results are supported by the study of Fijan *et al.* (2019) which reported that the respondents used probiotics mostly for prevention purposes during antibiotic treatments (53%) and improved digestion (36.8%). Another study by Havelda *et al.* (2021) reported that oral health, the maintenance of gut flora, cardiovascular health, and immune health were also chosen by the participants but not in a large proportion.

3.5 Reasons to consume or reject fresh milk

Figure 4 shows that the majority of consumers preferred to consume fresh milk (82.6%). The chi-square test in Table 6 showed that respondents from urban areas

(85.9%) consume fresh milk more than rural areas (77.4%). This might be due to different living conditions and demographic structures (Quang, 2019). Age has a major influence in this study probably because elderly consumers pay greater attention to health claims while younger consumers pay more attention to claims about increased energy levels when purchasing probiotic products (Ibrahim, 2016). There was a significant difference between age with consumption of fresh milk as the p -value = $0.013 < 0.05$ (Table 6). Out of 114 (82.6%) consumers who preferred consuming fresh milk, half of them preferred fresh milk because of its delicious taste (Figure 5). However, Figure 6 showed that there were few respondents (17.4%) who disliked fresh milk mainly because of the taste, cultural bias and natural dislike of the milk (Idamokoro *et al.*, 2019). Therefore, the taste of fresh milk plays an important role in

purchasing behaviour among consumers. Lack of information about the scientifically proven benefits is also one of the reasons consumers (4.2%) find difficulties in buying fresh milk (Avila *et al.*, 2020).

Do you like to consume fresh milk?

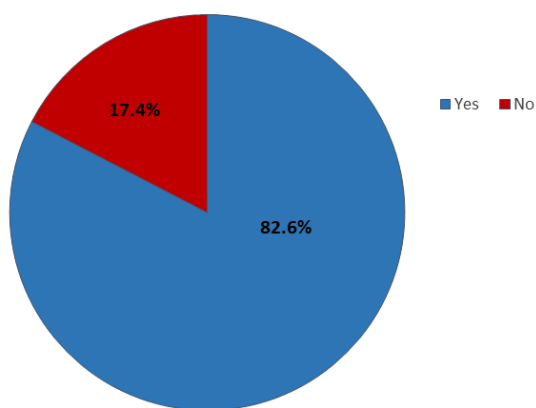


Figure 4. Pie chart of consumers' preferences on fresh milk.

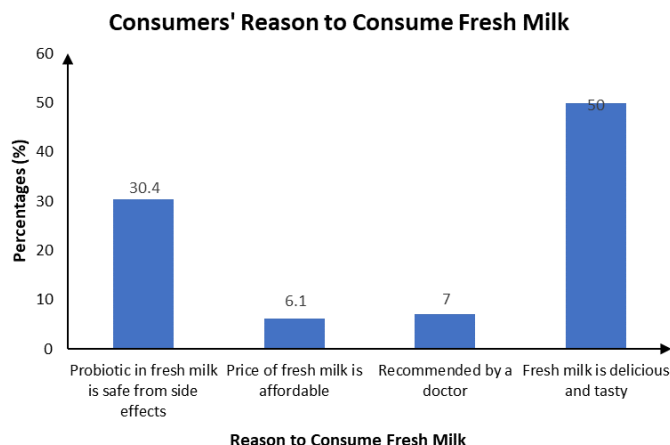


Figure 5. Bar chart consumers' reason to consume fresh milk.

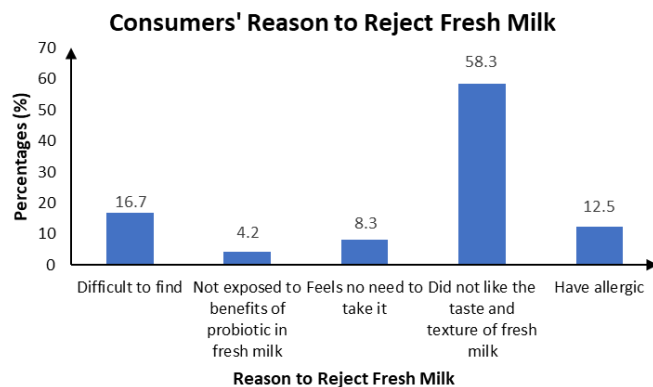


Figure 6. Bar chart of consumers' reason to reject fresh milk.

Table 6. Chi-square analysis between socio-demographic profiles and consumers' preferences on consumption of fresh milk.

| Variables | Socio-demographic profile | Total (n = 138) | Do you like to consume fresh milk? | | p-value |
|-------------------|------------------------------------|--------------------|------------------------------------|--------|---------|
| | | | Yes (%) | No (%) | |
| Gender | Male | 33 | 87.9 | 12.1 | 0.360 |
| | Female | 105 | 81.0 | 19.0 | |
| Age | Below 18 | 2 | 0.0 | 100.0 | 0.013 |
| | 18-24 | 91 | 80.2 | 19.8 | |
| | 25-34 | 11 | 90.9 | 9.1 | |
| | 35-44 | 27 | 88.9 | 11.1 | |
| | Above 45 | 7 | 100.0 | 0.0 | |
| Demographic Area | City | 85 | 85.9 | 14.1 | 0.199 |
| | Rural | 53 | 77.4 | 22.6 | |
| Educational Level | SPM and below | 24 | 83.3 | 16.7 | 0.729 |
| | Matriculation/Foundation/Form 6 | 30 | 76.7 | 23.3 | |
| | Bachelor's degree | 78 | 83.3 | 16.7 | |
| | Master | 3 | 100.0 | 0.0 | |
| | PhD/Professional | 3 | 100.0 | 0.0 | |
| Employment Status | Employed (in health field) | 12 | 91.7 | 8.3 | 0.508 |
| | Employed (not in the health field) | 34 | 94.1 | 5.9 | |
| | Unemployed | 92 | 77.2 | 22.8 | |
| Health Status | Yes | 21 | 71.4 | 28.6 | 0.142 |
| | No | 117 | 84.6 | 15.4 | |

3.6 Willingness to consume fresh milk after knowing its benefits

From Figure 7, 86.2% of respondents are willing to consume fresh milk as their diet routine after knowing the benefits of fresh milk. According to Pradito *et al.* (2020), participants' willingness to try a probiotic product was influenced by health behaviour and their initiative. There were still 13.8% of consumers who did not want to consume fresh milk at all after knowing its benefits. However, the percentage of consumers who still did not want to consume fresh milk is lower than consumers who rejected milk earlier (17.4%). This is probably because the consumers had increased awareness of the health benefits of fresh milk when answering the online survey. These similar results linked with a study by Idamokoro *et al.* (2019) where the respondents showed their willingness to consume fresh milk after receiving information about its nutritional benefits from interviewers.

Would you like to consume fresh milk as diet routine after knowing its benefits?

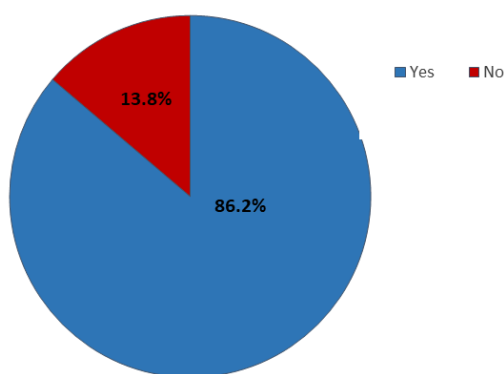


Figure 7. Pie chart of consumers' willingness to consume fresh milk.

4. Conclusion

In conclusion, more than 80% of Malaysian consumers were found to have awareness, knowledge and positive perception towards probiotics and fresh milk. However, the taste and texture of fresh milk affect customers' purchasing behaviour. In order to increase awareness and acceptability of probiotics in fresh milk, governments or institutions can organize an effective program about product awareness at exhibitions, campaigns and seminars in order to introduce to the public about benefits of probiotic products.

Conflict of interest

The authors declare no conflict of interest.

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