

RESEARCH ARTICLE

Awareness, perception and consumption pattern of probiotic dairy products in urban Bengaluru of Karnataka

Ravi Kumar¹, Shivaswamy GP¹(✉), Muniandy Sivaram¹, Somasekaran Subash¹, Rashmi H M² and Devaraja H C²

Received: 09 July 2025 / Accepted: 30 October 2025 / Published online: 23 July 2026

© Indian Dairy Association (India) 2026

Abstract: Growing diversification of consumers' food basket have created a market niche for probiotic dairy products as they offer potential health benefits beyond basic nutrition. The present study analysed the consumer awareness, perception, and the factors influencing consumer behaviour towards probiotic dairy products in urban Bengaluru. While, 53% of respondents were aware of probiotic dairy products, but only 23% actively consumed probiotic dairy products. Probiotic milk was the most preferred probiotic dairy product followed by probiotic yogurt and probiotic curd. Respondents in the higher age group had a significantly higher consumption of probiotic milk, whereas younger respondents had significantly higher consumption of probiotic ice cream. The study concludes that rising consumers' income was the main driver of consumption of probiotic dairy products in urban Bengaluru.

Keywords: Consumer behaviour, Consumer preference, Dairy market, Logistic regression, Health benefits

Introduction

In India, the probiotic concept is gaining popularity as consumers especially in urban areas are increasingly interested in enhancing overall health benefits beyond balanced diet. Probiotics are defined as living microorganisms which when administered in adequate amounts, confer a health benefit on the host (FAO/WHO, 2002). The consumption of probiotic foods helps in

inhibition of the growth of intestinal pathogens (Gleeson et al. 2011), enhanced immune system (Galdeano et al. 2019), lowered risk of diverse cancer types (Pino et al. 2020) and prevention and treatment of diabetes, obesity, osteoporosis, cardiovascular diseases and some allergic reactions (Soccol et al. 2010; Shafi et al. 2019).

The probiotic concept is strongly associated with dairy products as they provide an optimal environment for probiotic bacteria, maintaining suitable conditions such as temperature and pH along with an adequate substrate for their growth (Heller, 2001). Moreover, dairy products are the integral part of human diet in India, the world's largest producer of milk (239.30 million tonnes during 2023-24) contributing 24.76% to global milk production (GoI, 2024a). During 2023-24, dairy products accounted for the second largest share (8.33% in rural and 7.22% in urban) in monthly per capita food consumption expenditure (₹ 1939 in rural and ₹ 2776 in urban) after beverages, refreshments and processed foods (GoI, 2024b).

It is suggested that individuals with lactose intolerance also can safely consume probiotic dairy products, as probiotics aid in breaking down lactose into simpler sugars, reducing digestive discomfort (Oak and Jha, 2019). Lactobacilli and biūdobacteria are the most commonly used probiotic cultures in milk and its products such as curd, cheese and yogurt (Smith et al. 2013). India's probiotic market, including probiotic drinks, probiotic curd and probiotic yogurt, was valued at \$2.2 billion in 2024 (IMARC Group, 2025).

In this context, the probiotic dairy market in urban Bengaluru is well positioned with a presence of number of market players such as Yakult Danone India Pvt Ltd, Akshayakalpa, Amul, Epigamia, Milky Mist, Karnataka Milk Federation (KMF), Mother Dairy and Nestle. Further, the presence of large number of supermarket chains and quick home delivery services have enhanced consumer access and availability resulting in substantial market potential for probiotic dairy products. Urban Bengaluru has witnessed an increase in human population from 8.44 million in 2011 (GoI, 2013) to over 14 million in 2024 (UN, 2024) and the literacy rate was over 88.7%. Few studies have

¹Dairy Economics, Extension and Statistics Section, Southern Regional Station

ICAR-National Dairy Research Institute
Bengaluru, Karnataka 560 030, India

²Dairy Processing Section, Southern Regional Station
ICAR-National Dairy Research Institute
Bengaluru, Karnataka 560 030, India

Shivaswamy GP(✉)
Email: shiva644@gmail.com

reported the influence of socio-economic factors such as age, gender, education and income of the respondents on the consumption of probiotic dairy products (Schultz et al. 2011; Raihing and Mageshwari, 2014; Raghuwanshi et al. 2015). In view of the promising market for probiotic dairy products in urban Bengaluru, understanding consumers' preference for probiotic dairy products is necessary. Therefore, the present study was undertaken to analyse the awareness and behaviour of consumers towards probiotic dairy products in urban Bengaluru, and to determine socio-economic factors influencing consumption of different probiotic dairy products.

Materials and methods

Data collection

A primary survey was conducted during April-July, 2024 in east, west, north, south, and central zones of urban Bengaluru, Karnataka state, India (Figure 1). The two-stage stratified sampling technique was followed for the selection of sample consumers. The first stage units were market outlets from each zone, and the second and ultimate stage units were consumers. From each zone, a sampling frame of a list of market outlets, including supermarkets, dairy parlors, and retail outlets, was developed after preliminary visits. A sample of market outlets was selected using simple random sampling without replacement. From these market outlets, a total of 1112 consumers of dairy foods were interviewed and the data was collected using Kobo Toolbox which is a computer assisted personal interview tool.

In the present study, consumer awareness on probiotic dairy products refers to the extent to which individuals are informed about probiotic dairy products. It encompasses assessing the consumers' knowledge about probiotic dairy products, their impact on health and well-being and making choices based on accurate information. Consumption behaviour involves tracking preferred probiotic products, frequency of consumption, and purchase channels such as retail outlets, super markets and dairy parlors. Consumers' perception on reasons for selecting particular probiotic dairy product was collected using Likert's five-point scale ranging from 1 (least important) to 5 (highly important). The mean score and standard deviation was calculated for each attribute.

Statistical analysis

A chi-square test was employed to test the significance of the association between various socio-economic features of respondents and the consumption of probiotic dairy products.

Logistic regression model

The binary logistic regression model was employed to study the factors influencing consumption of probiotic milk among consumers of probiotic dairy products in urban Bengaluru. The dependent variable is a binary variable which denotes the probability that a sample household consumes probiotic milk.

The specification of the logistic regression model is as follows (Hosmer et al. 2013)

$$p(Y/x) = \frac{1}{(1 + e^{-\alpha - \beta x})}$$

$p(Y/x)$ is the probability of probiotic milk consumption, where Y takes the value 1 if the probiotic milk is consumed else it takes value 0; α and β are the model parameters to be evaluated; indicates the value of independent variables such as age of a respondent, gender, family size, education level and monthly income.

Odds ratio in favour of consuming probiotic milk is the ratio of the probability that a family will consume probiotic milk to the probability that it will not consume probiotic milk. It is given by

$$\text{Odds ratio} = \left(\frac{p(Y/x)}{1 - p(Y/x)} \right)$$

The logit model is estimated by taking the log of odds ratio as follows,

$$L_i = \ln \left(\frac{p(Y/x)}{1 - p(Y/x)} \right) = \alpha + \beta x$$

The logit model is estimated by taking the log of odds ratio as follows,

The level of significance for the statistical analysis was fixed at $p \leq 0.05$. The data analysis was carried out using STATA MP 15.1 software.

Results and Discussion

Demographic profile of respondents and awareness about probiotic dairy products

In order to analyse the awareness about probiotic dairy products in urban Bengaluru, the study included a sample size of 688 male and 424 female respondents. Majority of the respondents (53.32%) belonged to the age group of 26-35 years. Over 24% of

the respondents belonged to age group of 36-45 years, whereas 16.27% and 6.38% of the respondents aged below 26 years and above 45 years, respectively.

It was found that 53.48% of male and 51.11% of female respondents were aware of availability of probiotic dairy products in the market (Table 1). Chi-square test revealed that male and female respondents were equally aware of probiotic dairy products ($p > 0.05$). Overall, 52.61% of the respondents were aware

Table 1: Awareness and consumption of probiotic dairy products among sample respondents in urban Bengaluru

Demographic Variables	Category	Number of respondents	Awareness about probiotic dairy products (%)			Consumption of probiotic dairy products (%)		
			Yes	No	χ^2 - value	Yes	No	χ^2 - value
Gender	Male	688 (61.87)	53.49	46.51	0.56 $p = 0.454$	21.08	78.92	3.51 $p = 0.061$
	Female	424 (38.13)	51.18	48.82		25.94	74.06	
Age Group	<26 years	181 (16.28)	69.61	30.39	26.27 $p = 0.000$	45.86	54.14	65.83 $p = 0.000$
	26-35 years	593 (53.33)	48.74	51.26		17.20	82.80	
	36-45 years	267 (24.01)	51.69	48.31		20.97	79.03	
	>45 years	71 (6.38)	45.07	54.93		19.64	80.36	
Total		1112	52.61	47.39		22.93	77.07	

Note: Figures in parenthesis indicate percentage of total

Table 2: Association between socio-economic characteristics and consumption of different probiotic dairy products in urban Bengaluru

Socio-economic characteristics	No. of consumers	Probiotic milk (%)		Probiotic yogurt (%)		Probiotic curd (%)		Probiotic ice cream (%)	
		Yes	No	Yes	No	Yes	No	Yes	No
Gender									
Male	145	77.78	22.22	63.89	36.11	36.81	63.19	6.25	93.75
Female	110	67.89	32.11	62.39	37.61	33.94	66.06	6.42	93.58
χ^2 - value		3.1155 $p = 0.078$		0.0603 $p = 0.806$		0.2215 $p = 0.638$		0.0031 $p = 0.956$	
Age group									
25 years & below	86	60.24	39.76	54.22	45.78	37.35	62.65	14.46	85.54
26-35 years	102	82.18	17.82	70.30	29.70	31.68	68.32	2.97	97.03
36 years & above	67	78.18	21.82	69.09	30.91	32.73	67.27	1.82	98.18
χ^2 - value		13.652 $p = 0.008$		9.3137 $p = 0.054$		6.02 $p = 0.198$		14.0167 $p = 0.007$	
Education level									
Pre-university & below	35	66.20	33.80	58.22	41.78	24.46	75.54	9.64	90.36
Graduation	138	70.65	29.35	64.24	35.76	9.78	90.22	8.15	91.85
Postgraduate & above	82	74.16	25.84	69.09	30.91	17.98	82.02	3.37	96.63
χ^2 - value		0.3639 $p = 0.546$		0.9615 $p = 0.327$		0.6947 $p = 0.55$		2.2267 $p = 0.136$	
Monthly income (₹)									
20,000 & below	23	58.14	41.86	56.94	43.06	29.17	70.83	0.00	100.00
20,000 - 40,000	79	75.00	25.00	65.35	34.65	6.98	93.02	3.49	96.51
40,000 - 60,000	93	76.53	23.47	67.50	32.50	11.22	88.78	9.18	90.82
60,000 & above	60	81.82	18.18	70.91	29.09	15.15	84.85	9.09	90.91
χ^2 - value		12.427 $p = 0.006$		11.801 $p = 0.0187$		9.1190 $p = 0.28$		4.7925 $P = 0.188$	

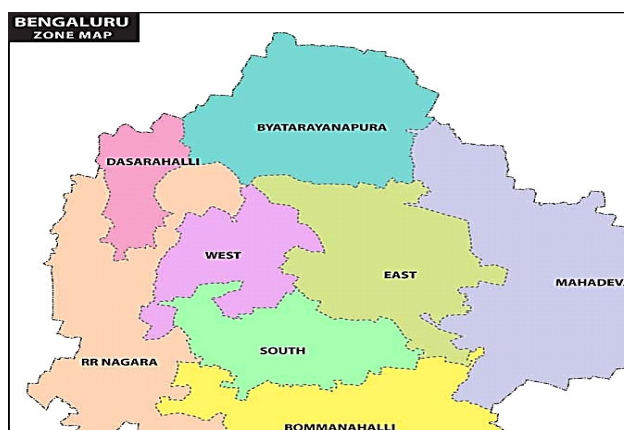


Fig. 1. Map showing different administrative zones of urban Bengaluru in Karnataka

of availability of probiotic dairy products in urban Bengaluru with those below 26 years having significantly greater awareness ($p < 0.01$). It shows that younger respondents had significantly higher access to information on probiotic dairy products mainly due to the familiarity and usage of the internet and social media.

Consumption rate of probiotic dairy products

Of 585 respondents who had knowledge about probiotic dairy products, only 23% consumed them (Table 1). This reveals that there was a significant gap between awareness and actual consumption level of probiotic dairy products. Higher price of probiotic dairy products compared with conventional dairy products was stated as the major reason for this gap. For instance, the average market price of 400 gram of probiotic curd in Bengaluru was Rs. 55, whereas the regular curd was priced at ¹ 34. Similarly, the price of 100 gram of probiotic yogurt (Rs. 60) was higher than that of regular yogurt (Rs. 45). Kaya et al. (2016) and Avila et al. (2020) also reported higher price as the major limiting factor for consumption of probiotic dairy products. The consumption of probiotic dairy products varied across the age groups with relatively higher consumption in the age group of below 26 years ($p < 0.01$). However, there was no significant variation in the consumption with gender. On the contrary, Schultz et al. (2011) reported that women were the main decision makers of food purchasing in the household and they were more interested in consuming probiotic food products than men.

Major probiotic products consumed

Probiotic milk emerged as the most preferred probiotic dairy product in urban Bengaluru with 72.94% of probiotic consumers favoring it (Figure 2). Probiotic milk was associated with Yakult, a Japanese brand of Yakult Danone joint venture, by the respondents revealing its popularity in the probiotic dairy market. While, 63% of the respondents consumed probiotic yogurt, probiotic curd and probiotic ice cream were consumed by 35%

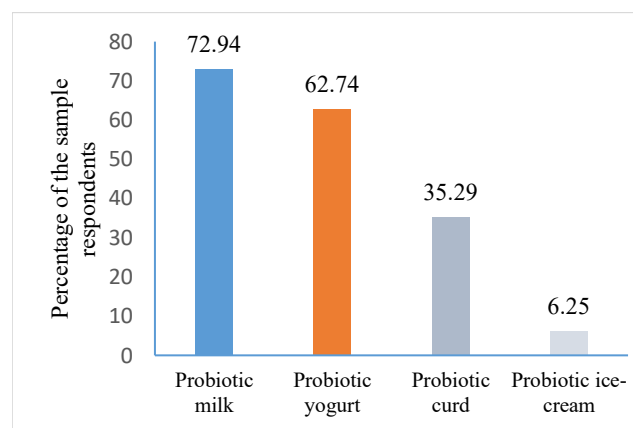


Fig 2. Major probiotic dairy products consumed by the sample

and 6% of respondents, respectively. Sahib et al. (2016) and Arora et al. (2020) also reported Yakult as the popular brand of probiotic milk in Haryana and Punjab, respectively. Yakult Danone joint venture has registered a tremendous growth in Tier 1 and 2 cities in India (Raghuwanshi et al. 2015). With a strong growth of e-commerce and organized quick home delivery services, probiotic dairy market is expected to gain further momentum in urban Bengaluru.

Socio-economic factors influencing consumption of different probiotic dairy products

Chi-square test revealed that respondents in the higher age group had a significantly higher consumption of probiotic milk ($p < 0.01$), whereas in case of probiotic ice cream, younger respondents had a significantly higher consumption ($p < 0.01$) (Table 2). There was no significant association of gender and education level with consumption of probiotic dairy products. There was a significant positive association between monthly income and consumption of probiotic milk ($p < 0.01$) and probiotic yogurt ($p < 0.05$), suggesting income as the significantly influencing factor of consumption of probiotic dairy products. Raghuwanshi et al. (2015) also reported that increasing income was the major driver of consumption of probiotic dairy products in India.

Determination of socio-economic differentials of consumption of probiotic milk using logistic regression analysis

It may be noted that of 255 consumers of probiotic dairy products, majority (73%) consumed probiotic milk indicating its popularity in urban Bengaluru. To further understand the socio-economic differentials for preference to probiotic milk among different probiotic dairy products, the study has employed binary logistic regression model and the results are reported in Table 3. The model had a McFadden pseudo R^2 of 0.27. We found no significant influence of demographic characteristics such as age, gender, family size and education level on consumption of

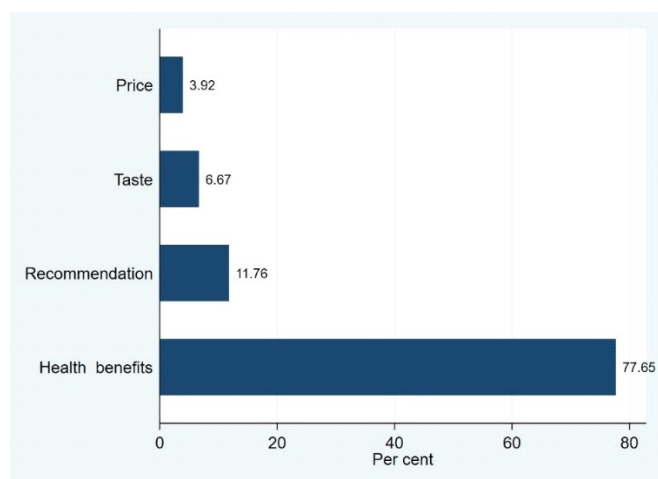


Fig 3. Reasons for consuming probiotic dairy products among respondents in urban Bengaluru

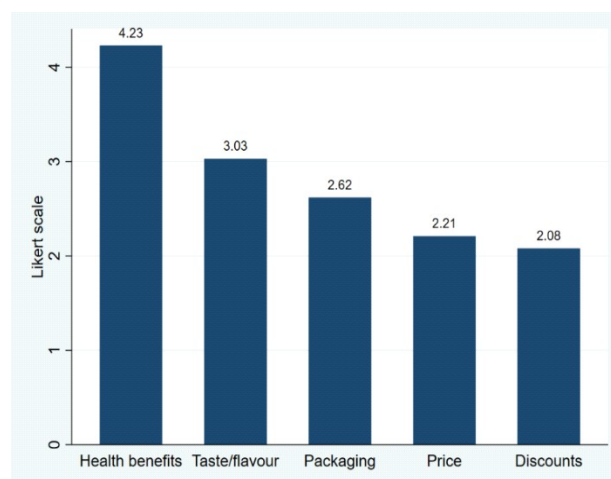


Fig 4. Reasons for selecting particular probiotic dairy product

Table 3: Factors influencing consumption of probiotic milk among respondents in urban Bengaluru (Binary logistic regression model)

Variables	B coefficients	Standard error	Z value	p value	Odds ratio in favor of consuming probiotic milk
Age group (Ref. <26 years)					
26-35 years (1=yes; 0=otherwise)	0.190	0.445	0.07	0.605	1.210
36 years and above (1=yes; 0=otherwise)	0.640	0.603	1.85	0.070	1.898
Gender (Ref. Female)					
Male (1=yes; 0=otherwise)	0.280	0.385	1.04	0.335	1.324
Family size (Ref. >4 members)					
4 members and below	0.204	0.364	0.78	0.491	1.227
Education (Ref. Below graduation)					
Graduation and above	0.340	0.436	1.08	0.273	1.405
Monthly family income (Ref. < ₹20,000)					
₹20,000 - ₹40,000	0.724	1.092	-1.38	0.171	2.063
₹40,001 - ₹60,000	0.810	0.707	1.65	0.024	2.249
₹60,001 - ₹80,000	1.132	0.278	1.82	0.006	3.102
Constant	-0.270	0.302	1.12	0.494	0.763
McFadden pseudo R ²			0.27		
Number of observations			255		

probiotic milk implying similar preferences for different probiotic dairy products across the groups. However, there was a significant positive association between monthly income and consumption of probiotic milk (Odds ratio=3.102; $p<0.01$), which reveals that as consumers' income increases the demand for probiotic milk will rise at faster rate as compared to other probiotic dairy products. It is noted that Yakult is the major brand of probiotic milk in urban Bengaluru. Accordingly, to attract attention of consumers, Yakult Danone Joint venture coordinates marketing campaigns using social media platforms, apart from regular television commercials and printed advertisements.

Consumption frequency of probiotic dairy products

Table 4 presents the results of consumption frequency of probiotic dairy products among respondents. It was found that majority of respondents (62.77%) in urban Bengaluru regularly consumed probiotic dairy products. The frequency of consumption of probiotic dairy products was significantly higher among respondents belonged to age group of above 36 years ($p<0.01$). Monthly income had a significant positive influence on regular consumption of probiotic dairy products ($p<0.01$). However, gender and education level of consumers had no significant association with consumption frequency.

Table 4: Association between socio-economic characteristics and consumption frequency of probiotic dairy products in urban Bengaluru

Socio-economic characteristics	No. of consumers	Frequency of consumption of probiotic dairy products (%)		χ^2 - value
		Regular	Occasional	
Gender				
Male	145	61.35	38.65	0.3492 p= 0.555
Female	110	64.86	35.14	
Age group				
25 years & below	86	51.09	48.91	9.3509 p = 0.009
26-35 years	102	64.20	35.80	
36 years & above	67	72.28	27.72	
Education level				
Pre-university & below	35	48.31	51.69	11.57 p = 0.071
Graduation	138	69.57	30.43	
Postgraduate & above	82	61.12	38.88	
Monthly income (₹)				
20,000 & below	23	20.83	79.17	22.05 p = 0.000
20,000 - 40,000	79	63.95	36.05	
40,001 - 60,000	93	62.12	37.88	
60,000 & above	60	72.45	27.55	
Overall	255	62.77	37.23	

Perceived reasons for consumption of probiotic dairy products

The major reason stated by respondents for consuming probiotic dairy products was their health benefits beyond basic nutrition (77.65%), followed by recommendation by others (11.76%) (Figure 3). Most of the respondents considered that probiotic dairy products had gastro-intestinal benefits. Similar findings were reported by previous studies (Arora et al. 2020; Ersan et al. 2020).

To further understand the motives behind consumers' choice of particular probiotic dairy product, consumers were asked to rank the factors they consider while choosing a particular probiotic dairy product on Likert's five-point scale ranging from 1 (least important) to 5 (highly important) (Figure 4). Health benefits had the highest score (4.23 (mean) $\pm$ 0.54 (SD)), followed by taste/flavor (3.03 $\pm$ 1.07), packaging (2.62 $\pm$ 1.04), price (2.21 $\pm$ 1.54) and discounts (2.08 $\pm$ 1.67). It implies that the consumers were aware of the necessity of consuming probiotic dairy products in order to maintain healthy lifestyle.

Conclusion

The study highlights a significant gap between awareness and actual consumption of probiotic dairy products in urban Bengaluru. The major reason for consuming probiotic food products was the health benefits beyond balanced nutrition. The consumption of probiotic dairy products increased with rise in monthly income. The study suggests to disseminate more awareness about the health benefits of the probiotic dairy

products among the public particularly among lower income groups and improve their affordability to reach out to all the sections of the consumers.

Acknowledgement

The present paper emanates from the M.Sc. research work of the first author titled 'Analysis of consumer behaviour towards probiotic dairy products in urban Bengaluru' conducted at Southern Regional Station of ICAR-National Dairy Research Institute, Bengaluru.

References

- Arora S, Prabha K, Sharanagat VS, Mishra V (2020) Consumer awareness and willingness to purchase probiotic food and beverage products: a study of Sonapat district, Haryana. *Br Food J* 123:2805-2817.
- Avila BP, Da Rosa PP, Fernandes TA, Chesini RG, Sedrez PA, De Oliveira APT, Mota GN, Gularte, MA, Roll VFB (2020) Analysis of the perception and behaviour of consumers regarding probiotic dairy products. *Int Dairy J* 106:104703.
- Ersan YL, Ozcan T, Akpınar Bayazit A (2020) Assessment of socio-demographic factors, health status and the knowledge on probiotic dairy products. *Food Sci Hum* 9:136-145.
- FAO/WHO (2002) Guidelines for the evaluation of probiotics in foods. Report of a joint FAO/WHO. In working group on drafting guidelines for the evaluation of probiotics in food. London, ON, Canada: FAO/WHO.
- Galdeanoa CM, Cazorlaa SI, Dumita JML, Velez E, Perdigon G (2019) Beneficial effects of probiotic consumption on the immune system. *Ann Nutr Metab* 74:115-124.
- Gleeson M, Bishop NC, Oliveira M (2011) Daily probiotic's (*Lactobacillus casei* Shirota) reduction of infection incidence in athletes. *Int J Sport Nutr Exerc Metab* 21: 55-64.

- GoI (Government of India) (2013) Population census of India 2011. Office of the Registrar General and Census Commissioner, Ministry of Home Affairs, Government of India, New Delhi.
- GoI (Government of India) (2024a) Basic animal husbandry statistics: 2024. Department of Animal Husbandry, Dairying and Fishery, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India, New Delhi.
- GoI (Government of India) (2024b) Fact sheet on household consumption expenditure survey: 2023. National Sample Survey Office, Ministry of Statistics and Programme Implementation, Government of India, New Delhi.
- Heller KJ (2001) Probiotic bacteria in fermented foods: product characteristics and starter organisms. *Am J Clin Nutr* 73:374-379.
- Hosmer DW, Lemeshow S, Sturdivant RX (2013) *Applied logistic regression*. Wiley, New York 500p.
- IMARC Group (2025) India probiotics market size, share, trends and forecast by product type, distribution channel, and region, 2025-2033.
- Kaya P, Karakan T, Sezgin S, Avci IA, Arusoglu G (2016) Determination of probiotic concept product consumption among people of ages 14-65. *Prog Nutr* 18:128-135.
- Oak S, Jha R (2019) The effects of probiotics in lactose intolerance: a systematic review. *Crit Rev Food Sci Nutr* 59:1675-1683.
- Pino A, De Angelis M, Chieppa M, Caggia C, Randazzo CL (2020) Gut microbiota, probiotics and colorectal cancer: a tight relation. *World Cancer Res J* 7:e1456.
- Raghuwanshi S, Misra S, Bisen PS (2015) Indian perspective for probiotics: A review. *Indian J Dairy Sci* 68:195-205.
- Raihing C, and Mageshwari US (2014) Consumer knowledge and awareness of prebiotic and probiotic foods. *Int. J. Sci. Res. Rev* 3:91-104.
- Sahib KP, Kaur PR, Pal SS, Apoorva S, Nidhi G (2016) Awareness and knowledge of people towards probiotics products in Punjab region. *Int J Appl Biol Pharm* 7:154-160.
- Schultz M, Baranchi A, Thurston L, Yu YC, Wang L, Chen J, Herbison P (2011) Consumer demographics and expectations of probiotic therapy in New Zealand: Results of a large telephone survey. *N Z Med J* 124:36-43.
- Shafi A, Raja HN, Farooq U, Akram K, Hayat J, Naz A, Nadeem HR (2019) Antimicrobial and antidiabetic potential of synbiotic fermented milk: A functional dairy product. *Int J Dairy Technol* 72:15-22.
- Smith TJ, Rigassio-Radler D, Denmark R, Haley T, Touge-Tecker R (2013) Effect of *Lactobacillus rhamnosus* LGG and *Biüdobacterium animalis* ssp. *lactis* BB-12 on health-related quality of life in college students affected by upper respiratory infections. *Br J Nutr* 109:1999-2007.
- Soccol CR, Vandenberghe LP, Spier MR, Medeirosl ABP, Yamaguishi CT, Lindner JD, Pandey A Soccol VT (2010) The potential of probiotics: A review. *Food Technol Biotechnol* 48:413-434
- UN (2024) World Population Prospects, population division, Department of Economic and Social Affairs, United Nations.