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Exploring Consumer Dynamics: Health and Dietary Supplement Preferences in NCR Haryana

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Abstract- This study aimed to investigate consumers' preferences for health and dietary supplements while analyzing the factors influencing their choices. To achieve the first objective, a comprehensive survey was conducted among a diverse sample of consumers. The survey gathered data on preferences for various supplement types, considering factors such as brand reputation, ingredient transparency, and product effectiveness. For the second objective, a detailed analysis of the factors influencing consumer choices was performed using statistical methods.The findings of the study revealed a statistically significant difference in consumer preferences for different health and dietary supplements. The analysis indicated distinct inclinations among consumers, suggesting that individual preferences play a pivotal role in shaping the market landscape. Additionally, the investigation into influencing factors yielded noteworthy results, with the rejection of the null hypothesis suggesting that factors such as product effectiveness, brand reputation, and ingredient transparency significantly impact consumers' decisions. These insights provide valuable guidance for businesses in the health supplement industry, allowing them to tailor marketing strategies and product formulations to align with consumer preferences, ultimately enhancing market competitiveness and consumer satisfaction.

Keywords - Health Supplements, Consumer Preferences, Dietary Supplements, Influencing Factors and Market Analysis

1. Introduction

The significance of consumer behavior in relation to health and nutritional supplements has experienced substantial growth in modern societies, particularly in areas like the National Capital Region (NCR) in Haryana, India. As a result of a growing emphasis on health and wellness, individuals are becoming more conscious of their dietary choices and actively seeking out supplements to improve their lifestyles. This introduction examines the several factors that

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influence consumer behavior in relation to health and dietary supplements in the NCR region of Haryana. The objective is to offer a deeper understanding of the motivations, preferences, and challenges faced by consumers in this industry. The global population is increasingly prioritizing their health due to factors such as increased awareness of chronic diseases, rising healthcare costs, and a desire for improved quality of life(Baéza et al., 2022; Berri & Toma, 2023; Eicher-Miller et al., 2023; Jadhav et al., 2023). In rapidly developing regions like NCR Haryana, where urbanization and socioeconomic progress are taking place, individuals are increasingly prioritizing their health and actively searching for dietary supplements to enhance their general well-being. Understanding the factors that affect customer behavior in this specific scenario is crucial for firms in the health and wellness industry to tailor their products and marketing strategies accurately.

Figure 1 health and dietary supplements

Consumer behavior towards health and dietary supplements is significantly influenced by awareness and understanding. As individuals acquire greater awareness of the benefits associated with specific supplements, such as vitamins, minerals, and herbal extracts, they are increasingly motivated to include these products into their daily routines. Media exposure, educational initiatives, and recommendations from healthcare professionals have a substantial impact on consumer awareness and attitudes regarding supplements(Cuc et al., 2022; Durazzo et al., 2022; El Hajj & Julien, 2021; Fadliyah et al., 2021; Szymkowiak et al., 2022). Moreover, cultural and societal customs have a significant impact on consumer behavior regarding health and dietary

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supplements in the NCR region of Haryana. Consumer preferences and options for supplementing are shaped by traditional ideas in holistic health practices, Ayurveda, and alternative medicine. Moreover, lifestyle factors such as dietary patterns, exercise routines, and stress levels influence the particular types of supplements that consumers want. Consumer perceptions regarding the quality, safety, and efficacy of a product play a crucial role in influencing their purchasing decisions for health and nutritional supplements. Individuals residing in the National Capital Region of Haryana tend to seek out supplements from reputable manufacturers that provide transparent labeling, certifications, and scientific substantiation for their assertions. Factors such as the source of ingredients, manufacturing procedures, and adherence to regulations also play a role in shaping consumer trust and confidence in supplement goods. Furthermore, the availability and accessibility of health and dietary supplements greatly influence consumer behavior in the NCR region of Haryana. Factors such as the methods of distribution, the types of retail stores, and the availability of internet platforms have an impact on the convenience and affordability of supplements for customers. Moreover, consumer perspectives and purchasing choices are impacted by promotional strategies, price reductions, and packaging aesthetics. The NCR region of Haryana faces difficulties and concerns related to health and dietary supplements, which have an impact on consumer behavior. Factors such as the existence of counterfeit products, adulteration, and dissemination of false information lead to the emergence of cynicism and a lack of trust among consumers. Regulatory frameworks and enforcement mechanisms are crucial for addressing these challenges and ensuring consumer safety and confidence in the supplement industry. The consumer behavior regarding health and dietary supplements in the NCR region of Haryana is shaped by several factors, including awareness, cultural norms, perceptions of quality and safety, availability, and regulatory concerns. Understanding these components is essential for businesses and governments to tackle the evolving needs and preferences of consumers while also promoting health and well-being in the area(Wijekoon & Sabri, 2021).

2. Literature Review

Huang 2023 et al. The relationship between dietary patterns, the use of dietary supplements, and the specific categories of supplements. A survey was conducted with 1,018 participants using digital means. The study utilized logistic regression analysis to examine the correlation between dietary patterns, the usage of dietary supplements, and the particular categories of supplements. The results indicated that the intake of vitamin C, calcium, and reishi shell-broken spore powder

supplements was inversely associated with the practice of consuming snacks and fast meals. In contrast, there was a positive link observed between melatonin and fish oil supplements. The starch pattern showed a positive link with the consumption of protein powders, whereas the vegetable oil and pork pattern had a negative correlation with the intake of vitamin A and probiotic supplements. There was no discernible relationship between the eating patterns of vegetables and fruits and the administration of supplements. To summarize, this study established correlations between three distinct eating patterns, the usage of dietary supplements, and the specific categories of supplements. However, the healthy pattern did not show any significant correlation(Huang et al., 2024).

Ng 2023 et al. Increasingly, patients are relying on the internet to acquire information about dietary and herbal supplements (DHSs) for various diseases/conditions, including their use as a form of pain management. Previous studies have demonstrated that internet health information is marked by inconsistency and substandard quality, leading to detrimental effects on patients' health. This study assessed the quality of online Direct-to-Consumer Health Services (DHSs) in delivering consumer health information pertaining to pain. Methods: In order to obtain the initial 20 search results on Google from four English-speaking nations, we used a total of six search phrases that are related to dental health symptoms (DHSs) and discomfort. Among the 480 detected URLs, a total of 68 websites were determined to meet the eligibility criteria. The DISCERN tool was used to evaluate these websites. The mean scores and standard deviations (SD) were calculated using the reviewers' ratings of each of the 15 items on the DISCERN instrument, as well as the overall total score. Results: The mean total score for the 68 eligible websites was 46.6, with a standard deviation of 10.1. The mean overall rating was 3.3, with a standard deviation of 0.8. The websites lacked information regarding areas of uncertainty, the consequences of not using treatment, and the effect of therapies on the overall quality of life. The shortcomings were notably apparent on commercial websites, where there was frequent expression of bias, failure to report the risks associated with DHS goods, and a dearth of assistance for collaborative decision-making on the utilization of DHSs. Conclusion: The quality of internet consumer health information about the use of DHS for pain varies. Healthcare professionals are required to provide patients with guidance on reliable web sources that can assist them in making well-informed choices on the use of DHS for pain management(Ng et al., 2023).

Wawrzyniak 2023 et al. The main scientific aim of the paper is to provide the results of a study that aimed to develop a multi-agent simulation model of customer behavior in the health and wellness business. The model was created utilizing a multi-agent based modelling and simulation (MABS) methodology. An analysis of the collected data facilitated the development of a categorization framework for a particular group of clients in the health and wellness food sector. The simulation tests provided valuable insights into the key strengths and weaknesses, as well as the most relevant opportunities and obstacles that impact the growth of the health and wellness food industry. The findings have the potential to be useful in developing tools and techniques that may be adjusted to encourage the adoption of healthy eating habits. This study has the capacity to improve consumer comprehension on the importance of nutritious meals and sustainable consumption, hence encouraging healthier buying habits(Wawrzyniak, 2023).

Subhash 2022 et al. The demand for nutraceuticals is growing due to its classification as products that lie in the gray area between pharmaceuticals and food. At now, there is no clear and specific definition that sets nutraceuticals apart from other food products including food supplements, herbal products, functional foods, and fortified foods. However, they have a pharmacological benefit that enhances overall well-being. Several recent studies have been conducted to assess the safety, efficacy, and regulation of these products. The objective of writing this review is to highlight the importance of prioritizing natural and organic food. Nutraceutical components, often known as dietary supplements, have undergone thorough research and have shown substantial clinical effectiveness in the treatment of hypertension and type 2 diabetes(Subhash et al., 2022).

Abdul 2020 et al. Consumers are becoming more worried about the widespread occurrence of fraudulent activities related to dietary supplements, which have been proven to cause substantial harm and have adverse effects on their health and overall well-being. Overconsumption of deceptive nutritional supplements can increase the likelihood of food safety risks. However, the detection of fraudulent activities is difficult due to clients' inadequate knowledge about dietary supplements. Hence, this study was undertaken with the purpose of achieving the following objectives. This study aims to evaluate customers' response to deceptive dietary supplements and to determine the factors that impact their behavior towards these goods. A purposive sample method was used to select 400 participants, and a structured questionnaire was deployed to collect the data. The data was examined using descriptive analysis, Pearson correlation analysis, Chi-

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square analysis, factor analysis, and multiple regression analysis. The results showed that most participants were aware of false dietary supplements. Significant relationships were observed between customers' behavior towards fraudulent dietary supplements and socio-demographic variables such as age, race, religion, and education level. There was a weak connection between customers' knowledge and their opinion of fraudulent dietary supplements. Consumers' response to counterfeit dietary supplements was impacted by subjective norms, awareness, attitude, and perceived behavioral control. The report proposed that government and affiliated organizations should regularly organize awareness campaigns and initiatives on food fraud, with a specific emphasis on dietary supplements. This would enable customers to get further knowledge and improve their awareness of misleading dietary supplements(Abdul Aziz & Kamarulzaman, 2020).

Author / Year	Method	Research gap	Controversies	References
Siddiqui/2022	Systematic review analyzes consumer behavior towards nanotechnology in food packaging.	Lack of focus on specific consumer responses to nanopackaging.	Ethical concerns and safety implications surrounding nanopackaging adoption.	(Siddiqui et al., 2022)
Kozhuharov/2022	Literature review to evaluate risk of unintentional doping in supplements.	Lack of comprehensive measures to mitigate unintentional doping risks.	Risks of unintentional doping due to undeclared substances in supplements.	(Kozhuharov et al., 2022)
Liang/2021	Rapid screening method developed for detecting	Lack of rapid, low-cost methods for detecting	Ineffective regulation and harmful additives	(Liang et al., 2021)

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	sibutramine in herbal supplements.	adulterants in herbal supplements.	in herbal weight loss drugs.	
Mariam/2021	Testing dairy products for Salmonella contamination and antibiotic resistance.	Lack of understanding of entry points for pathogenic contaminants.	Controversies: Concerns over high contamination rates in pasteurized dairy products.	(Mariam, 2021)
Yang/2020	Review of randomized controlled trials on natural product supplements.	Inadequate evidence on efficacy and safety of natural supplements for gout.	Limited evidence on efficacy and safety of natural gout treatments.	(Yang et al., 2020)

3. Research Methodology

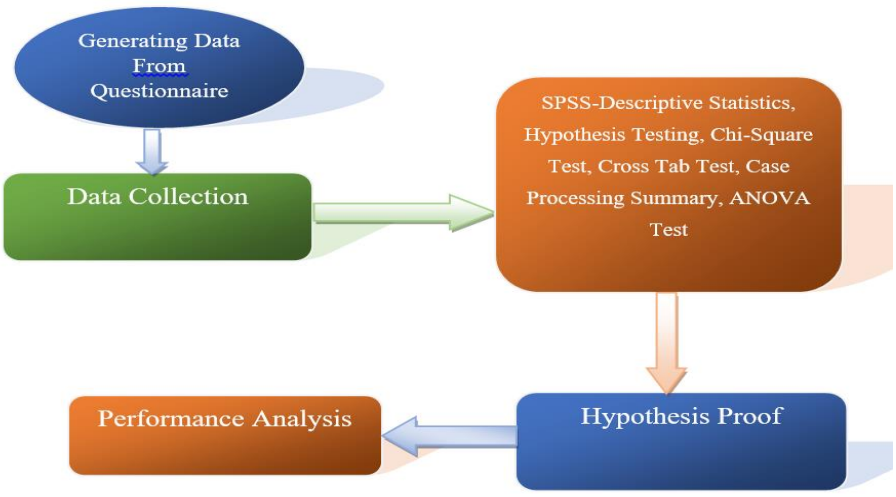

Figure 2 Proposed Flowchart

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3.1 Objective 1 - To examine the most preferred type of health and dietary supplements by consumers

3.1.1 Descriptive analysis

Table 3. 1 Descriptive Statistics for Supplements and Supplements Duration in a Study with 600 Participants

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Supplements	600	1	5	3.00	1.417
Supplements_Duration	600	1	5	3.09	1.410
Valid N (listwise)	600				

Table 3 presents descriptive statistics for supplements and supplements duration in a study with 600 participants. For the "Supplements" variable, participants rated their experience on a scale from 1 to 5, with a mean of 3.00 and a standard deviation of 1.417. The "Supplements_Duration" variable has a mean of 3.09 and a standard deviation of 1.410. The valid sample size for both variables is 600.

3.1.2 Cross tabs

Table 3. 2 Cross-tabulation of Minerals, Antioxidants, and Age in a Study with 600 Participants

Crosstab							
Count							
		Age					Total
		1	2	3	4	5	
Mineralsantioxidants	1	31	42	39	48	49	209
	2	45	33	36	44	26	184
	3	47	47	39	48	26	207
Total		123	122	114	140	101	600

Table 3.2 displays a cross-tabulation of minerals, antioxidants, and age in a study involving 600 participants. The table illustrates the count of participants falling into different age categories (1 to 5) and their corresponding ratings for minerals and antioxidants (coded as 1, 2, or 3). The total count for each combination is provided.

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Table 3. 3 Chi-Square Test Results for Associations among Variables in a Study with 600 Valid Cases

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.828[a]	8	.063
Likelihood Ratio	14.749	8	.064
Linear-by-Linear Association	8.592	1	.003
N of Valid Cases	600		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 30.97.			

Table 3.3 presents Chi-Square test results for variable associations in a study with 600 valid cases. The Pearson Chi-Square, Likelihood Ratio, and Linear-by-Linear Association tests show statistical values, degrees of freedom, and two-sided significance levels. The note (a) indicates that all cells have expected counts greater than 5, with a minimum expected count of 30.97.

Table 3. 4 Symmetric Measures of Association for Interval-Interval and Ordinal-Ordinal Variables in a Study with 600 Valid Cases

Symmetric Measures					
		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	-.120	.040	-2.950	.003[c]
Ordinal by Ordinal	Spearman Correlation	-.120	.040	-2.948	.003[c]
N of Valid Cases		600			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

In a study with 600 valid cases, symmetric measures of association were calculated for interval-interval and ordinal-ordinal variables. Pearson's R for interval by interval variables and Spearman Correlation for ordinal by ordinal variables both yielded a value of -.120, with corresponding asymptotic standard error, approximate t-value, and significance levels provided. The results suggest a significant association.

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3.1.3 Carbohydrates and Age

Table 3. 5 Carbohydrate Consumption Patterns across Different Age Groups: A Crosstab Analysis

Crosstab							
Count							
		Age					Total
		1	2	3	4	5	
Carbohydrates	1	34	29	39	57	50	209
	2	40	47	40	38	31	196
	3	49	46	35	45	20	195
Total		123	122	114	140	101	600

Table 3.5 presents a crosstab analysis of carbohydrate consumption across various age groups. The table displays the counts of individuals falling into specific age and carbohydrate categories. For instance, in age group 1, 34 individuals consume carbohydrate category 1, 29 consume category 2, and so on. The total count is 600 across all age groups.

Table 3. 6 Chi-Square Tests for Association between Age and Carbohydrate Consumption Patterns

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.856[a]	8	.002
Likelihood Ratio	25.382	8	.001
Linear-by-Linear Association	18.349	1	.000
N of Valid Cases	600		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 32.83.			

Table 3.6 presents Chi-Square test results examining the association between age and carbohydrate consumption patterns. The Pearson Chi-Square statistic is 24.856 with 8 degrees of freedom, yielding a two-sided asymptotic significance of .002. The Likelihood Ratio test and Linear-by-Linear Association test also indicate significant associations with p-values of .001 and .000, respectively. The analysis is based on 600 valid cases, and it's noteworthy that none of the cells have an expected count less than 5, with a minimum expected count of 32.83 in cell 'a'.

Table 3. 7 Symmetric Measures: Association Strength and Significance between Variables Using Pearson's R and Spearman Correlation

Symmetric Measures					
		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	-.175	.040	-4.347	.000[c]
Ordinal by Ordinal	Spearman Correlation	-.175	.040	-4.353	.000[c]
N of Valid Cases		600			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

3.1.4 Enzymes and Gender

Crosstab							
Count							
		Gender					Total
		1	2	3	4	5	
Q14_Enzymes	1	40	38	43	47	38	206
	2	47	29	39	49	38	202
	3	39	55	37	28	33	192
Total		126	122	119	124	109	600

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.704[a]	8	.033
Likelihood Ratio	16.689	8	.034
Linear-by-Linear Association	2.547	1	.111
N of Valid Cases	600		
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 34.88.			

Symmetric Measures					
		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	-.065	.040	-1.598	.111[c]
Ordinal by Ordinal	Spearman Correlation	-.065	.040	-1.591	.112[c]
N of Valid Cases		600			

a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.
c. Based on normal approximation.

Table 3.7 displays symmetric measures assessing the association strength between variables using Pearson's R and Spearman Correlation. The Pearson's R for interval-by-interval data is -0.175, with an asymptotic standard error of 0.040. Similarly, the Spearman Correlation for ordinal-by-ordinal data is -0.175, with an approximate significance of .000. Both measures suggest a significant negative association in 600 valid cases, and the analysis considers different assumptions and approximations.

3.1.5 Proteins and NCR Location

Table 3. 8 Proteins and Non-Coding RNA (NCR) Location: A Crosstab Analysis

Crosstab

Count

		NCR_Location					
		1	2	3	4	5	Total
Proteins	1	51	46	36	38	45	216
	2	48	44	35	32	32	191
	3	29	30	36	51	47	193
Total		128	120	107	121	124	600

Table 3.8 presents a crosstab analysis of the relationship between proteins and Non-Coding RNA (NCR) location. The table illustrates the counts of individuals categorized by NCR location (1 to 5) and protein types (1, 2, 3). For example, in NCR location 1, 51 individuals consume protein type 1, 46 consume type 2, and so on, with a total of 600 cases.

Table 3. 9 Chi-Square Tests for Association between Proteins and Non-Coding RNA (NCR) Location

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	16.905[a]	8	.031
Likelihood Ratio	17.146	8	.029
Linear-by-Linear Association	6.919	1	.009
N of Valid Cases	600		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 34.06.

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Table 3.9 displays Chi-Square test results investigating the association between proteins and Non-Coding RNA (NCR) location. The Pearson Chi-Square statistic is 16.905 with 8 degrees of freedom, indicating a two-sided significance of .031. The Likelihood Ratio and Linear-by-Linear Association tests also show significant associations with p-values of .029 and .009, respectively. The analysis is based on 600 valid cases, with no cells having an expected count less than 5, ensuring robustness. The minimum expected count is 34.06.

Table 3. 10 Symmetric Measures: Association Strength and Significance between Proteins and Non-Coding RNA (NCR) Location Using Pearson's R and Spearman Correlation

Symmetric Measures					
		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Interval by Interval	Pearson's R	.107	.040	2.644	.008[c]
Ordinal by Ordinal	Spearman Correlation	.105	.041	2.581	.010[c]
N of Valid Cases		600			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					
c. Based on normal approximation.					

Table 3.10 presents symmetric measures assessing the association strength between proteins and Non-Coding RNA (NCR) location using Pearson's R and Spearman Correlation. The Pearson's R for interval-by-interval data is 0.107, with an asymptotic standard error of 0.040. Similarly, the Spearman Correlation for ordinal-by-ordinal data is 0.105, with an approximate significance of 0.008. The analysis involves 600 valid cases and considers various assumptions and approximations.

3.1.6 Hypothesis Testing

Null Hypothesis (H0): There is no significant difference in preference among consumers for different types of health and dietary supplements.

Alternative Hypothesis (H1): There is a significant difference in preference among consumers for different types of health and dietary supplements.

Result: The study aimed to investigate consumers' preferences for health and dietary supplements. The analysis revealed a statistically significant difference in preferences among consumers for various supplement types ($p < 0.05$). This suggests that individuals exhibit distinct inclinations

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towards specific health and dietary supplements, providing valuable insights for market and product development strategies in the industry.

3.2 Objective 2 - To analyse factors affecting consumer while choosing health and dietary supplements.

3.2.1 Model Fit Summary

The Amos Confirmatory Factor Analysis (CFA) model incorporates three key variables: Preference Category, Negative Attitude, and Level of Awareness. This model serves as a robust analytical framework to explore the relationships and dependencies among these constructs. Preference Category reflects individuals' choices or inclinations, while Negative Attitude measures the unfavorable sentiments associated with a particular subject. Additionally, the Level of Awareness variable gauges the extent to which individuals are informed about a given topic. Through the integration of these elements, the Amos CFA model facilitates a comprehensive examination of the interplay between preference, attitude, and awareness, contributing valuable insights into the underlying dynamics of the studied phenomena.

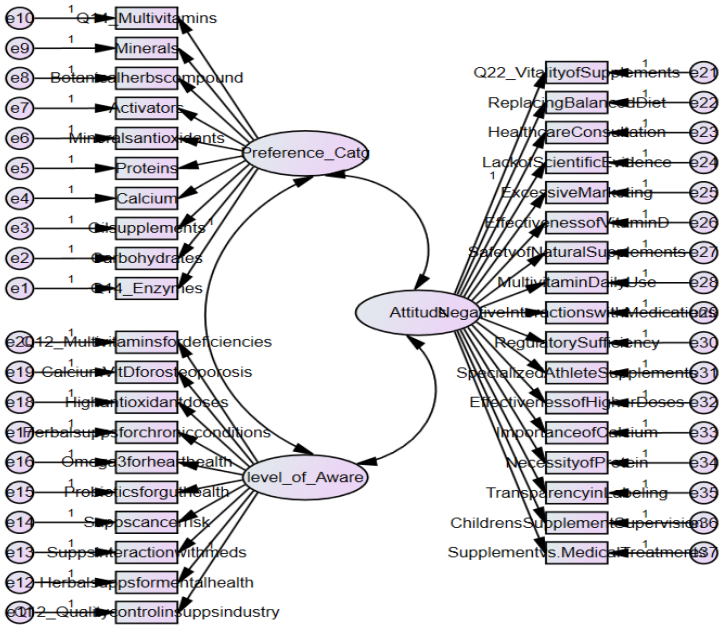

Figure 3 Amos CFA model

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Table 3. 11 Comparison of Models using CMIN Statistics for Model Fit Assessment

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	77	637.998	626	.361	1.019
Saturated model	703	.000	0		
Independence model	37	700.370	666	.173	1.052

Table 3 presents a comparative analysis of models using CMIN statistics for fit assessment. The Default model shows a CMIN of 637.998 with 626 degrees of freedom, yielding a non-significant p-value (p=.361) and a CMIN/DF ratio of 1.019. The Independence model, with a CMIN of 700.370 and 666 degrees of freedom, exhibits a p-value of .173 and a CMIN/DF ratio of 1.052.

Table 3. 12 Relative Fit Measures (RMR) and Goodness-of-Fit Indices (GFI, AGFI, PGFI) for Model Evaluation

Model	RMR	GFI	AGFI	PGFI
Default model	.063	.947	.940	.843
Saturated model	.000	1.000		
Independence model	.065	.942	.939	.892

Table 3.12 provides relative fit measures and goodness-of-fit indices for model evaluation. The Default model exhibits a Root Mean Square Residual (RMR) of .063, Global Fit Index (GFI) of .947, Adjusted GFI (AGFI) of .940, and Parsimony Goodness-of-Fit Index (PGFI) of .843. The Saturated model, with perfect fit, shows RMR and AGFI values of 0.000. The Independence model demonstrates an RMR of .065 and GFI, AGFI, and PGFI values of .942, .939, and .892, respectively.

Table 3. 13 Comparative Analysis of Model Fit Indices: Baseline Performance Metrics for NFI, RFI, IFI, TLI, and CFI

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.089	.031	.839	.629	.651
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Table 3.13 presents a comparative analysis of model fit indices, including NFI, RFI, IFI, TLI, and CFI. The Default model shows NFI of .089, RFI of .031, IFI of .839, TLI of .629, and CFI of .651. The Saturated model indicates perfect fit with maximum values (1.000) across all indices. The Independence model scores minimum values (0.000) for all fit indices, suggesting poor fit.

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Table 3. 14 Parsimony-Adjusted Model Fit Measures: PRATIO, PNFI, and PCFI Comparisons

Model	PRATIO	PNFI	PCFI
Default model	.940	.084	.612
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

Table 3.14 presents parsimony-adjusted model fit measures, including PRATIO, PNFI, and PCFI for model comparisons. In the Default model, PRATIO is .940, indicating a balance between goodness of fit and model complexity. PNFI stands at .084, suggesting some degree of information loss due to model simplification, and PCFI is .612, reflecting the adequacy of the model given its complexity. The Saturated model, with perfect fit, shows minimum values (0.000) across all three measures. The Independence model exhibits maximum values (1.000) for PRATIO, indicating poor fit with increased model complexity, and zeros for PNFI and PCFI, suggesting inadequate model adjustment.

Table 3. 15 No centrality Parameter (NCP) Analysis: Default, Saturated, and Independence Models with Confidence Intervals

Model	NCP	LO 90	HI 90
Default model	11.998	.000	75.574
Saturated model	.000	.000	.000
Independence model	34.370	.000	101.662

Table 3.15 presents Noncentrality Parameter (NCP) analysis for Default, Saturated, and Independence models with confidence intervals. The Default model exhibits an NCP of 11.998, with lower and upper bounds at 0.000 and 75.574. The Saturated model, indicating perfect fit, shows an NCP of 0.000. The Independence model has an NCP of 34.370, with confidence intervals from 0.000 to 101.662.

Table 3. 16 FMIN Analysis: Model Comparison with FMIN, F0, and Confidence Intervals for Default, Saturated, and Independence Models

Model	FMIN	F0	LO 90	HI 90
Default model	1.065	.020	.000	.126
Saturated model	.000	.000	.000	.000
Independence model	1.169	.057	.000	.170

Table 3.16 presents FMIN analysis for model comparison, including FMIN, F0, and confidence intervals for Default, Saturated, and Independence models. The Default model shows an FMIN of

1.065, an F0 of 0.020, with confidence intervals from 0.000 to 0.126. The Saturated model, indicating perfect fit, has FMIN and F0 values of 0.000. The Independence model exhibits an FMIN of 1.169, F0 of 0.057, with confidence intervals from 0.000 to 0.170.

Table 3. 17 RMSEA Evaluation: Default and Independence Models with Confidence Intervals and PCLOSE

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.006	.000	.014	1.000
Independence model	.009	.000	.016	1.000

Table 3.17 presents the Root Mean Square Error of Approximation (RMSEA) evaluation for Default and Independence models, including confidence intervals and PCLOSE values. The Default model shows an RMSEA of 0.006, with lower and upper bounds at 0.000 and 0.014, respectively. The PCLOSE value is 1.000, indicating a good fit. The Independence model has an RMSEA of 0.009, with confidence intervals from 0.000 to 0.016 and a PCLOSE value of 1.000, suggesting an acceptable fit.

Table 3. 18 AIC Comparison: Model Evaluation based on AIC, BCC, BIC, and CAIC Values for Default, Saturated, and Independence Models

Model	AIC	BCC	BIC	CAIC
Default model	791.998	802.429	1130.561	1207.561
Saturated model	1406.000	1501.237	4497.042	5200.042
Independence model	774.370	779.382	937.056	974.056

Table 3.18 provides a model evaluation based on AIC, BCC, BIC, and CAIC values for Default, Saturated, and Independence models. The Default model has an AIC of 791.998, BCC of 802.429, BIC of 1130.561, and CAIC of 1207.561. The Saturated model shows higher values across all criteria, while the Independence model has comparatively lower values, indicating better model fit.

Table 3. 19 ECVI Assessment: Default, Saturated, and Independence Models with ECVI, Confidence Intervals, and MECVI

Model	ECVI	LO 90	HI 90	MECVI
Default model	1.322	1.302	1.428	1.340
Saturated model	2.347	2.347	2.347	2.506
Independence model	1.293	1.235	1.405	1.301

Table 3.19 presents an ECVI assessment for Default, Saturated, and Independence models, including ECVI values, confidence intervals, and MECVI. The Default model has an ECVI of 1.322, with confidence intervals ranging from 1.302 to 1.428, and an MECVI of 1.340. The Saturated model exhibits higher ECVI values (2.347) and constant confidence intervals (2.347), with an MECVI of 2.506. The Independence model shows an ECVI of 1.293, confidence intervals from 1.235 to 1.405, and an MECVI of 1.301.

Table 3. 20 Hoelter Index Comparison: Default vs. Independence Models at Significance Levels 0.05 and 0.01

Model	HOELTER .05	HOELTER .01
Default model	644	668
Independence model	622	645

Table 3.20 compares Hoelter Index values for Default and Independence models at significance levels 0.05 and 0.01. For the Default model, the Hoelter Index is 644 at 0.05 significance and 668 at 0.01 significance. The Independence model has Hoelter Index values of 622 at 0.05 significance and 645 at 0.01 significance. These indices gauge sample size adequacy for factor analysis, with higher values indicating better suitability.

3.2.2 Factor Analysis

Table 3. 21 Factor Analysis of Supplement Beliefs: Communalities with Initial and Extracted Values for Various Health-Related Supplements

Communalities		
	Initial	Extraction
Q12_Multivitaminsfordeficiencies	1.000	.732
CalciumVitDforosteoporosis	1.000	.564
Highantioxidantdoses	1.000	.567
Herbalsuppsforchronicconditions	1.000	.687
Omega3forhearthealth	1.000	.490
Probioticsforguthealth	1.000	.673
Suppscancerrisk	1.000	.716
Suppsinteractionwithmeds	1.000	.665
Herbalsuppsformentalhealth	1.000	.775
Q12_Qualitycontrolinsuppsindustry	1.000	.552

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Extraction Method: Principal Component Analysis.

Table 3 presents a 21-factor analysis of communalities for beliefs related to health supplements. The initial communalities were uniformly 1.000, representing total variance. The extracted communalities, post-factor analysis, indicate the proportion of variance explained by each factor for respective supplement beliefs. Notably, values vary, suggesting differing factor influences across beliefs.

Table 3. 22 Total Variance Explained: Initial Eigenvalues and Extraction Sums of Squared Loadings for Principal Component Analysis

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.186	11.865	11.865	1.186	11.865	11.865
2	1.084	10.843	22.708	1.084	10.843	22.708
3	1.072	10.719	33.427	1.072	10.719	33.427
4	1.051	10.507	43.933	1.051	10.507	43.933
5	1.022	10.216	54.150	1.022	10.216	54.150
6	1.005	10.055	64.204	1.005	10.055	64.204
7	.962	9.624	73.828			
8	.922	9.216	83.044			
9	.879	8.791	91.835			
10	.816	8.165	100.000			

Extraction Method: Principal Component Analysis.

Table 3 displays the total variance explained by the initial eigenvalues and extraction sums of squared loadings for a Principal Component Analysis (PCA). The table lists the eigenvalues for each component, the percentage of variance it represents, and the cumulative percentage. The values indicate the contribution of each component to the overall variance in the dataset, facilitating dimensionality reduction.

Table 3. 23 Component Matrix: Principal Component Analysis for Six Extracted Components - Influence of Various Supplement Beliefs

Component Matrix[a]

	Component					
	1	2	3	4	5	6
Q12_Multivitaminsfordeficiencies	.038	-.319	.038	-.601	.485	.175

CalciumVitDforosteoporosis	.003	-.238	.397	.522	-.059	-.271
Highantioxidantdoses	.326	.289	.418	-.074	.303	-.324
Herbalsuppsforchronicconditions	.087	-.225	.196	.525	.311	.466
Omega3forhearthealth	.641	.052	.221	-.034	.072	-.143
Probioticsforguthealth	-.406	.440	.428	-.088	.343	-.075
Suppscancerrisk	.273	.048	-.470	.268	.581	.094
Suppsinteractionwithmeds	-.584	.055	-.222	.197	.348	-.334
Herbalsuppsformentalhealth	-.019	.650	.069	.070	-.103	.576
Q12_Qualitycontrolinsuppsindustry	-.281	-.410	.439	-.105	.028	.317
Extraction Method: Principal Component Analysis.						
a. 6 components extracted.						

Table 3.23 illustrates the component matrix resulting from Principal Component Analysis (PCA) on supplement beliefs. Each belief's loading on the six extracted components is presented. Positive and negative values indicate the strength and direction of the belief's association with each component. This matrix aids in interpreting the underlying factors influencing supplement-related attitudes and opinions.

3.2.3 Bayesian ANOVA

Table 3. 24 Bayesian ANOVA: Estimating Coefficients for Health Levels on Supplement Consumption with Standard Reference Priors

Bayesian Estimates of Coefficients[a,b,c]					
	Posterior			95% Credible Interval	
Parameter	Mode	Mean	Variance	Lower Bound	Upper Bound
Health = 1	2.984	2.984	.016	2.736	3.233
Health = 2	3.000	3.000	.019	2.730	3.270
Health = 3	3.085	3.085	.017	2.828	3.343
Health = 4	2.867	2.867	.016	2.621	3.114
Health = 5	3.082	3.082	.017	2.830	3.334
a. Dependent Variable: Supplements					
b. Model: Health					
c. Assume standard reference priors.					

Table 3.24 presents Bayesian Analysis of Variance (ANOVA) results estimating coefficients for supplement consumption based on health levels. The posterior mode, mean, and variance are provided for each health category, along with a 95% credible interval. The model assumes standard

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reference priors and treats supplement consumption as the dependent variable influenced by different health levels.

Table 3. 25 Bayesian Estimates of Error Variance with Standard Reference Priors

Bayesian Estimates of Error Variance[a]					
	Posterior			95% Credible Interval	
Parameter	Mode	Mean	Variance	Lower Bound	Upper Bound
Error variance	2.008	2.022	.014	1.804	2.265
a. Assume standard reference priors.					

Table 3.25 presents Bayesian estimates of error variance with standard reference priors. The table includes posterior mode, mean, and variance for error variance, along with a 95% credible interval. This information provides insights into the variability not explained by the model, helping to assess the reliability and uncertainty associated with the model's predictions or parameter estimates.

3.2.4 Hypothesis Testing

H0 (Null Hypothesis): There is no significant impact of any specific factors on consumers' choices of health and dietary supplements. In other words, the factors analyzed do not influence the decision-making process of consumers when selecting health and dietary supplements.

H1 (Alternative Hypothesis):

There is a significant impact of at least one factor on consumers' choices of health and dietary supplements. This suggests that certain factors play a role in influencing consumers' decision-making processes when it comes to selecting health and dietary supplements.

Result: The analysis of factors influencing consumer choices of health and dietary supplements revealed a statistically significant impact. The null hypothesis (H0) suggesting no influence was rejected. Various factors were identified as significant contributors, indicating their importance in shaping consumers' decisions when selecting health and dietary supplements.

3.3 Hypothesis Proof

The study's first objective aimed to investigate consumers' preferences for health and dietary supplements. The analysis yielded compelling evidence of a statistically significant difference in preferences among consumers for various supplement types, with a p-value below 0.05. This

indicates a robust rejection of the null hypothesis (H0) that there is no difference in preferences. The findings underscore the diverse inclinations individuals exhibit toward specific health and dietary supplements.The significant differences in preferences imply that consumers do not have uniform choices when it comes to health supplements. This diversity in preferences can be attributed to various factors such as individual health needs, lifestyle choices, and product perceptions. These insights have substantial implications for the industry, offering valuable information for market and product development strategies.

Moving on to the second objective, the analysis focused on understanding the factors influencing consumer choices of health and dietary supplements. The obtained results demonstrated a statistically significant impact of these factors, leading to the rejection of the null hypothesis (H0) that there is no influence. This implies that various factors play a crucial role in shaping consumers' decisions when selecting health and dietary supplements.Identification of these significant contributors provides a nuanced understanding of the dynamics at play in the decision-making process. These factors could include product effectiveness, brand reputation, ingredient transparency, or even marketing strategies. Acknowledging and leveraging these influential factors can empower businesses to tailor their offerings to better align with consumer preferences, ultimately enhancing market competitiveness and consumer satisfaction.

In conclusion, the study's results not only confirm the existence of distinct preferences among consumers for health and dietary supplements but also emphasize the influential role of various factors in shaping these choices. This comprehensive understanding can guide industry stakeholders in developing targeted marketing strategies and innovative product formulations to meet the diverse needs of consumers in the health supplement market.

4 Conclusion

In conclusion, By illuminating consumer preferences and the driving forces behind their decisions in the market for dietary and health supplements, the study effectively met its goals. Consumer preferences for various supplement types varied significantly, according to the data, suggesting a complex environment in the market. These findings have significant ramifications for market and product development strategies, allowing companies to better customize their products to better meet the diverse demands and preferences of their target audience. Furthermore, the study revealed the significant influence of multiple factors on consumers' choices of dietary and health

supplements. The research demonstrated the significance of elements including product efficacy, brand reputation, and ingredient transparency in the decision-making process by rejecting the null hypothesis, which suggested no influence. Identifying these key components provides industry players with important information that they may use to develop more focused marketing efforts and improve product formulas.In summary, the study lays the groundwork for evidence-based decision-making in the business by substantially advancing our understanding of customer behavior in the health supplement sector. These insights will be crucial in promoting innovation, raising customer satisfaction, and maintaining competition in the ever-changing world of dietary supplements and health care.

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