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Factors Affecting the Use and Understanding of Nutrition Labeling on Food Labels among Nepalese Youths

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ABSTRACT–Nutrition labeling, crucial for informing consumers about food content, faces significant gaps in Nepal's regulatory framework. These gaps impact how the nutritional information is understood and used by consumers, contributing to challenges like obesity and chronic diseases in the country. This study aims to uncover the factors affecting the use and understanding of nutrition labeling on food labels among Nepalese youths. Conducted through a cross-sectional approach, this research involved administering a structured questionnaire to 225 participants in June 2023, targeting regular consumers of packaged foods. Data analysis, employing both descriptive and multivariate principal component analysis using SPSS 25, revealed that 24% of respondents always read nutrition labeling on food labels in packed food items. The Principal Component Analysis identified four key factors affecting the use and understanding of nutrition labeling: "perception of the nutritional information", "motivations in dietary decisions", "awareness" and "health priority interest in nutritional attributes". These factors collectively explained over 54% of the variance in the data, as validated by the scree plot and Kaiser Criterion. The study underscores the necessity of initiatives aimed at enhancing the accessibility, clarity, and appeal of nutritional labeling on food labels in packaged food products. Such initiatives are pivotal for policymakers, educators, and marketers striving to encourage healthier dietary practices among Nepalese youths.

KEYWORDS–***Nutrition labeling, Food labels, Nepalese youths, Principal component analysis, Healthier dietary practices***

1. INTRODUCTION

Food labels serve as an information source and frequently represent the initial means of direct communication with consumers. However, their full Apotential is not consistently maximized. Labels can serve as a tool to reinforce general claims and create product distinctions, not only between various food categories but also within a specific category (Caswell & Mojduszka, 1996; Golan et al., 2001). Moreover, labels provide a source of health-related information for associating products and may, infrequently, be the consumer's first exposure to a health-related problem. Nutrition labels are envisioned to benefit consumers who select more healthful foods (Stranieri & Banterle, 2009). Highlighting direct economic advantages related to nutrition or health claims, accurate and well-understood claims enhance purchasing decisions. Furthermore, providing nutrition labeling stimulates producers to craft

healthier food options and aids consumers in adopting healthier diets, consequently reducing expenses linked to diet-related illnesses (Yeh et al., 2018).

Nutrition labeling is a well-established policy measure for informing consumers about the contents of pre-packaged foods (Hall & Grummon, 2020). Nutrition labels furnish consumers with details regarding the nutritional composition of food items, empowering them to make knowledgeable and health-conscious dietary decisions (Stantiall & Serventi, 2018). Nutrition labelling, as a tool, can play a crucial role in promoting healthier eating habits by offering vital information regarding the nutritional composition of foods. Nutrition labels enhance consumers' comprehension regarding food healthiness and prompt manufacturers to reformulate their products, thereby expanding the accessibility of healthier food options. The effectiveness of nutrition labeling can be influenced by various factors such as food costs, taste preferences, cultural backgrounds, and individual attributes like age, gender, education, and body weight (Christoph & Ellison, 2017; Crockett et al., 2014).
Familiarity with nutrition labeling is found to be vital in consumer information processing in general, and nutrition label use in particular (Annunziata & Vecchio, 2012; Moorman, 1996); Consumers appraise themselves as more able to process nutrition information if they are acquainted with the information (Moorman, 1990). Consumers may explore food labels more enthusiastically (Grunert & Wills, 2007) or read labels more precisely (Cowburn & Stockley, 2005) if they are familiar with labeling policies, labeling techniques, labeling procedures, and the entire labeling norms and conditions. By contrast, consumers' perceived understanding of nutrition labels may decline if they are not aware of the information indicated on the label and their interpretations (Burton et al., 1994)

A wide range of studies demonstrate high levels of self-reported awareness and use of nutrition information among consumers, especially youths, with healthier dietary intake. However, consumers have difficulty understanding and applying the quantitative information displayed in nutrition facts tables, with many unable to correctly calculate and apply nutrient amounts, serving sizes, and consumable quantity (Acton et al., 2023). Understanding and utilizing nutrition labels is associated with adopting a more nutritious diet compared to individuals who do not use them, and it also plays a crucial role in enhancing public safety and promoting overall health. Different personal characteristics, such as age, gender, and education, influence how individuals interpret and use nutrition labels (Christoph & Ellison, 2017). Accordingly, many countries encourage parents to educate children on the use of nutrition labels when selecting packaged food products. Many young people also report using nutrition fact tables; however, like adults, youths struggle to understand and apply nutrient values (Haidar et al., 2017; Hobin et al., 2015). According to 'Nutrition Labels and Health Claims: The Global Regulatory Environment' published by World Health Organization (WHO) in 2004, the information on the nutrient content and the health promotion effect of processed foods are particularly important, and nutrition labels are useful tools to deliver this information (Hawkes & Organization, 2004).

Virtually all countries have some form of nutrition facts tables on the 'back' or 'side' of the food packages, which usually display nutrient levels, energy content, and ingredient lists. For a considerable period, both the US and Canada have enforced the compulsory inclusion of nutrition labels on nearly all processed food items (Kang et al., 2011). In Nepal, food safety is regulated through the Food Act, 1966 which restricts the production, distribution, and sale of adulterated or sub-standard foods. The Food Regulation of 1970 outlines general requirements for food labeling related to packaging, language, and other aspects (Khalid, 2015). However, it does not specifically mandate the labeling of nutrient content, such as calories, fats, sugars, and sodium. This regulatory gap has led to a lack of specific regulations regarding nutrition labeling in Nepal (Shrestha, 2022). While several studies have been conducted in various countries to assess understanding levels of youths on nutrition labeling, Nepal, despite facing the emerging challenge of obesity and Non-communicable chronic diseases (NCDs), lacks extensive research in this area. More specifically; Nepal lacks specific mandates on nutrition labeling in its

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regulatory framework; potentially impacting how consumers, especially youths, understand and utilize nutritional information. There is a noticeable absence of comprehensive research on how Nepalese youths interpret nutrition labels. Additionally, while youths are known to use nutrition labels, they encounter difficulties in comprehending and applying the precise scaling, and the specific quantity of the ingredients in a consumable scale. Moreover, the nationwide campaign on understanding the nutrition fact tables, their significance, and the essentialities of accepting them as fundamental credentials of processed food items seem mandatory. Bridging these gaps within Nepal's local context is essential for tailored interventions to enhance nutritional awareness among Nepalese youth. Furthermore, exploring the alignment or divergence of global best practices in nutrition labeling with Nepal's context remains unexplored, underscoring the need for targeted research to evaluate perceptions of nutritional labels and their efficacy in promoting healthier dietary choices. In this regard, this specific article serves as the doctrine document more especially to the Nepalese youths residing in the rural and underdeveloped areas.

2. MATERIALS AND METHODS

2.1 Study Population, Sample Size and Sampling Technique

This quantitative cross-sectional study targeted Nepalese youths aged above 18 years who were responsible for purchasing packaged food products in their households, either as the primary shopper or sharing this responsibility. To achieve this, a sample size of 228 was determined using statistical parameters such as a population proportion of success of 0.50, a margin of error of 6.5%, and a Z^2 of 3.841, which corresponds to the standard error associated with a 95% confidence level.

For this, we adopted the required mathematical formula from the reference (Kotrlik & Higgins, 2001).

Following the calculation of the samples, participants were interviewed from all Provinces across Nepal. These participants were selected to represent diverse demographics, encompassing different genders, age groups, occupations, and educational backgrounds. The sampling method employed for this research was convenience sampling, chosen for its ease of access to subjects rather than adhering to a more stringent sampling procedure (Marshall, 1996). Despite the aim for 228 samples, data were obtained from 225 participants, resulting in a non-response rate of 1.3%.

2.2 Questionnaire Preparation and Data Collection

In June 2023, data collection occurred through a self-administered structured questionnaire designed based on previous studies about nutrition labeling usage and comprehension (Annunziata & Vecchio, 2012; Aygen, 2012; Deakin, 2011; Liu et al., 2015). The questionnaire, consisting of 30 questions primarily employing closed-ended responses and organized into five sections, aimed to glean insights into various aspects. The initial section assessed respondents' viewpoints on nutrition issues, including their dietary habits and lifestyles. Subsequent sections delved into consumers' perceptions of food labels, evaluating their frequency of use and reasons for utilizing or disregarding label information. Another section focused on gauging consumers' familiarity and preferences regarding label details, while another assessed their ability to interpret and apply label information. Finally, the last section collected socio-demographic information. This structured questionnaire, executed via KoBo Collect, garnered responses from a total of 225 participants, capturing their opinions and perspectives.

2.3 Data Analysis

The data collected through KoBo Collect was exported to MS Excel and carefully cleaned, removing any erroneous entries. After thoroughly cleaning the dataset, it was transferred to SPSS version 25 for additional analysis. Descriptive statistical techniques such as frequency, percent, mean, and standard deviation were employed to summarize the demographic variables.

Moreover, we employed multivariate statistical tools, specifically conducting a factor analysis with principal component analysis (PCA). The main aim of this PCA is to condense the correlation patterns among the observed variables and streamline the extensive set of variables into more manageable components (Wold et al., 1987).

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3. RESULT AND DISCUSSION

3.1 Demography of Respondents

Out of the total respondents (n=225), 60% were male, and of the total 45% of them were married. The average age of the respondents was 28.3 years, with a standard deviation of 4.5 years. Regarding education, 40% had completed secondary education, 35% had completed a bachelor's degree, and the rest had completed a master's degree. In terms of occupation, approximately one-third (34%) were students, followed by employees working in either government or private organizations (32%). Self-employed individuals accounted for 15% of the respondents, while 10% were housewives. The remaining 12% were currently unemployed.

3.2 Respondent's Propensity towards Nutrition Issues and Nutrition Labeling

Among the total respondents (n=225), 82% prefer purchasing food items from traditional retail stores, while the remaining 18% opt for supermarkets. Additionally, 63.6% consciously select foods for overall well-being and a healthy lifestyle. Another 25.8% base their food choices on personal preferences and the enjoyment of nutritious options. Moreover, 7.6% consider food intolerance, which leads to physical discomfort like bloating or abdominal pain, while 3.1% make dietary choices due to health issues such as cardiovascular diseases or diabetes. Regarding lifestyle, 38% regularly undergo health check-ups, and approximately 30% have modified their eating habits over time due to health concerns.

The respondents revealed the factors guiding their food purchasing decisions. Remarkably, 52.4% prioritize freshness, considering it a pivotal attribute. Notably, 40.4% place substantial importance on nutritional properties when selecting food items. A smaller fraction, 4.4%, factors in brand reputation, while an even smaller percentage, 2.8%, considers the country or region of origin in their purchase decisions.

A question was queried regarding whether respondents read nutrition labeling while making purchases at the sales point. Out of the total respondents, 24% reported that they always read the nutrition labeling, while the remaining indicated that they do not. This

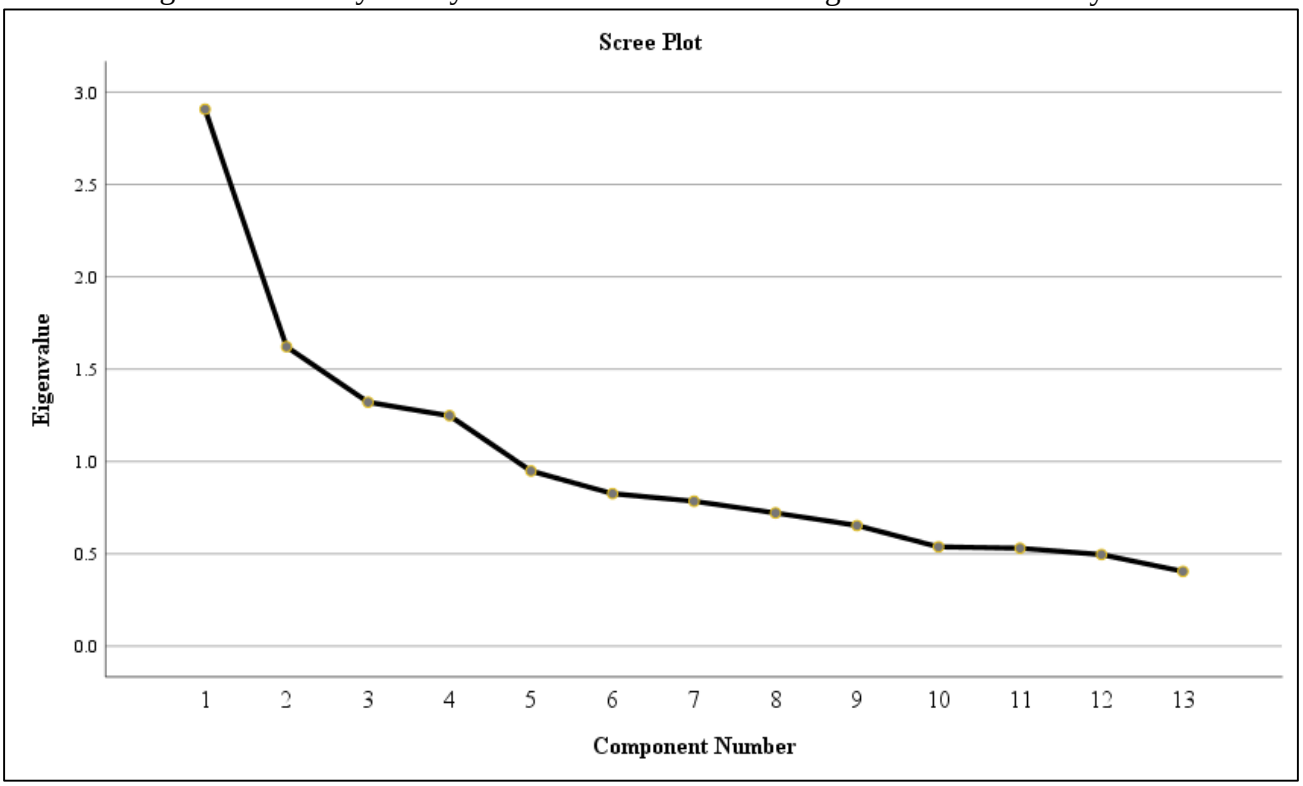

Figure 1. Scree Plot

result is matched with the study conducted in 38 countries across Europe (Wills et al., 2009). Similarly, respondents were questioned about which food categories read nutritional labels more frequently and found that 44.0% read while purchasing fruit juices/soft drinks, followed by cookies and snacks (34.0%), buying children's foods (18.0 %), and cereals (4.0%). Similarly, respondents were inquired about the main motivation behind reading nutrition labels and found that more than half (52%) stated that they read labels to assess the quality features of the food before purchasing and consuming it while the remaining (48%) reported getting information.

A separate question was asked to the respondents regarding their perception on understanding of nutrition labeling on food labels. Of the respondents, 49.8% fully agree that nutritional information is written in letters that are too small. Likewise, only 35.6% fully agree that the nutritional information displayed on food packages is always truthful. In addition, 50.2% reported that they quite agree with the notion that the terminology used on nutrition labels is too scientific and difficult to understand. Furthermore, 39.6% reported that they fully agree that nutritional information is always well-visible and legible. Meanwhile, 40% reported that it is usually difficult to identify the nutritional values associated with a portion. These outcomes are matched with previous research on information on food labels in Europe (Annunziata & Vecchio, 2012; Cowburn & Stockley, 2005; Drichoutis et al., 2006) that reported nutrition labeling particularly confusing for consumers, particularly due to the use of technical/scientific and numerical information.

3.3 Factors Affecting the Use and Understanding of Nutrition Labeling on Food Labels Using PCA

3.3.1 Reliability Analysis:

Cronbach's alpha (α) was employed to assess the internal consistency of the factors related to the perception of nutrition labeling. The obtained alpha value of 0.734 indicated a good level of reliability (Hair Jr et al., 2019), which exceeded the recommended threshold of 0.70 proposed by (Nunnally, 1978).

3.3.2 Kaiser–Meyer–Olkin (KMO) and Bartlett's tests:

Kaiser–Meyer–Olkin (KMO) and Bartlett's tests were performed to examine the suitability of these data for PCA (Table 1). The KMO measure of sampling adequacy of items was performed and found 0.713, in the good range according to (Kaiser, 1974). Additionally, Bartlett's test was significant (χ^2 = 446.271, df = 78, Sig. = .000) as per Table 1, indicating a significant correlation among the variables and thus making it suitable for factor analysis (Bartlett, 1950).

Table 1: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.713
Bartlett's Test of Sphericity	Approx. Chi-Square (χ^2)	446.271
	df	78
	Sig.	.000

3.3.3 Factor extraction:

The Scree test and eigenvalue rule were used to identify four components through Varimax rotation. Based on the results shown in Figure 1, it was found that there are four factors with eigenvalues greater than one that contribute significantly to the total variability observed in the data (Jackson, 1993). On the other hand, the remaining factors only account for a minor proportion of the variability and are therefore considered less important (Zwick & Velicer, 1986).

In Table 2, each factor is presented with its corresponding eigenvalue and percentage of variance explained by each component.

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Table 2. Eigenvalue and total variance explained by the components

Total Variance Explained									
	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.907	22.362	22.362	2.907	22.362	22.362	2.768	21.293	21.293
2	1.621	12.472	34.835	1.621	12.472	34.835	1.635	12.573	33.866
3	1.321	10.162	44.996	1.321	10.162	44.996	1.349	10.378	44.245
4	1.248	9.599	54.595	1.248	9.599	54.595	1.346	10.350	54.595
5	.948	7.295	61.890						
6	.826	6.353	68.243						
7	.785	6.038	74.281						
8	.721	5.548	79.828						
9	.653	5.025	84.853						
10	.538	4.137	88.990						
11	.530	4.079	93.070						
12	.496	3.816	96.886						
13	.405	3.114	100.000						
Extraction Method: Principal Component Analysis.									

As per Table 2, Component 1 has the highest eigenvalue of 2.907 and accounts for 22.362% of the variance, followed by Component 2 with an eigenvalue of 1.621 and explaining 12.472% of the variance, component 3 with an eigenvalue of 1.321 and explaining 10.162% of the variance, component 4 with an eigenvalue of 1.248 and explaining 9.599% of the variance. Overall, these four factors account for a combined 54.595% of the total variance in the use and understanding of nutrition labeling in food labels among Nepalese youths.

Table 3: Matrix of the rotated principal components

Indicators	**Components**			
	Perception of the Nutritional Information	Motivation for dietary choices	Awareness	Interest in nutritional attributes
Sometimes I choose the healthier option: it depends on the price.				0.754
I always choose the healthiest option although it is more expensive.				0.684

I am not interested in the nutritional attributes of the food products I eat.		–0.708		
It is usually easy to interpret nutritional information.	0.605			
The terminology used to provide nutritional advice is too scientific.	–0.574			
Nutritional information is written in too small letters.	–0.741			
It is usually difficult to identify the nutritional values related to a portion.	–0.676			
Nutritional information is always well-visible and legible.	–0.525			
Nutritional information is always truthful.			0.524	
I can evaluate the importance of the advice at the nutrition level.			0.757	
I can understand the information related to nutrition.			0.625	
I have healthy dietary habits.		0.681		
Motivation affecting diet choices.		0.661		
Rotation method: Varimax with Kaiser normalization.				

Table 3 presents a scoring system consisting of 13 indicators used to assess comprehension factors that affect the use and understanding of nutrition labeling on food labels.
All 13 of these were recognized as noteworthy, and they were subsequently categorized into four distinct components. Factors with a loading exceeding 0.5 were selected to maintain these components (Chang et al., 2008).

Component 1: Perception of the Nutritional Information

Component 1, labeled as "Perception of the Nutritional Information" is a major component for the use and understanding of nutrition labeling on food labels among Nepalese youths. This component comprises five distinct variables: usually easy to interpret nutritional information, the terminology used to provide nutritional advice is too scientific, nutritional information is written in too small letters, usually difficult to identify the nutritional values related to a portion, and nutritional information is always well-visible and legible. The variables correlate .605, -.574, -.741, -.676, and 0.525 with component 1, respectively, and account for 22.362% of the total variance with an eigenvalue of 2.907. This suggests that individual perceptions regarding the clarity and accessibility of nutritional information remarkably affect the use and understanding of nutrition labeling. These findings are matched with the study conducted by (Annunziata & Vecchio, 2012; Grunert, Wills, et al., 2010; Ringold, 2021). This signifies that how Nepalese youths perceive the clarity and accessibility of nutritional information significantly influences their comprehension of nutrition labels. The negative correlations, particularly with concerns about scientific terminology, small font size, and difficulty in identifying nutritional values, indicate that these perceptions could act as barriers, potentially

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hindering the effective utilization of nutrition labeling among this demographic.
Understanding these perceptions is critical for tailored interventions aimed at improving nutritional awareness among Nepalese youths. Addressing the concerns highlighted in this component—such as improving the legibility of labels, simplifying scientific terminology, and enhancing the visibility of nutritional details - can be pivotal in fostering a better use and understanding of nutrition labeling. Moreover, initiatives focusing on educational campaigns or interventions targeting these specific perceptions can play a vital role in encouraging more informed and health-conscious dietary choices among Nepalese youths.

Component 2: Motivations in Dietary Decisions

Component 2, referred to as "Motivations in Dietary Decisions" emerged as the second most important component in comprehending the use and understanding of nutrition leveling of food labels. This component includes three variables: not interested in the nutritional attributes of the food products eaten, having healthy dietary habits, and motivation affecting diet choices. These variables exhibit respective correlations of -.708, .681, and .661 with component 2. Together, they contribute to 12.472% of the variance, with an eigenvalue of 1.621. These insights shed light on the multifaceted motivations driving the dietary decisions of Nepalese youths. These findings are aligned with the research conducted by (Affram & Darkwa, 2015; Giró-Candanedo et al., 2022; Grunert, Fernández-Celemín, et al., 2010; Malloy-Weir & Cooper, 2017; Shrestha, 2022).

The negative correlation with disinterest in nutritional attributes suggests that a segment of this demographic may not prioritize examining the nutritional content of their food. Conversely, positive correlations with healthy dietary habits and motivational factors indicate a noteworthy inclination among many Nepalese youths towards health-conscious dietary choices. Understanding these motivations is critical in tailoring interventions and educational programs geared toward this demographic.

Encouraging healthy dietary practices and fostering motivation for nutritious food choices emerge as pivotal strategies in promoting a balanced and healthful diet among Nepalese youths. Furthermore, it underscores the necessity for nuanced messaging and targeted educational campaigns that align with the specific motivations and preferences prevalent among this demographic.

Component 3: Awareness

Component 3, labeled "Awareness" emerges as the third pivotal factor influencing the utilization and comprehension of nutrition labeling on food labels among Nepalese youths. This component encapsulates three variables: the perceived truthfulness of nutritional information, the capability to evaluate nutritional advice's importance, and the capacity to understand nutrition-related information. These variables demonstrate correlations of .524, .757, and .625, respectively, with Component 3. Collectively, they contribute to 10.162% of the overall variance, indicated by an eigenvalue of 1.321.
These findings underscore that a noteworthy part of Nepalese youth place value on the accuracy and reliability of nutritional information provided. Their ability to evaluate the significance of nutritional advice reflects a level of awareness and engagement in making informed dietary choices. These results are similar to the findings of (Alkerwi et al., 2015; Churuangsuk et al., 2020; Nutbeam, 2000; Salama & Esmail, 2018).
This inclination suggests a positive tendency towards informed decision-making based on dependable nutritional data.
Understanding the depth of nutritional comprehension among Nepalese youths is vital for tailoring educational initiatives that cater to their specific needs. It emphasizes the significance of providing trustworthy and clear nutritional guidance that resonates with the preferences and requirements of this demographic. Moreover, it highlights the empowering role of accessible and accurate nutritional information in guiding Nepalese youths toward informed dietary decisions for their overall well-being.

Component 4: Health Priority Interest in Nutritional Attributes

Component 4, termed "Health Priority Interest in Nutritional Attributes" emerges as

a significant aspect influencing the assessment of food nutrition among Nepalese youths. This component incorporates variables related to choosing healthier options based on price considerations and always prioritizing the healthiest choice despite higher costs. These variables exhibit correlations of .754 and .684, respectively, with Component 4. Together, they contribute to 9.599% of the overall variance, indicating their substantial influence on nutritional decision-making.

This signifies that a notable portion of Nepalese youths highly prioritize health when making dietary choices. They demonstrate a conscious effort to opt for healthier food options, even when faced with higher prices. This positive inclination aligns with the global trend of prioritizing health and well-being in dietary decisions (Beal & Ortenzi, 2023; Burton et al., 2006; Klopčič et al., 2020).

3.4 Reliability of the Retained Components

Table 4: Cronbach's alpha values for retained components

Retained Components	Cronbach's alpha
Perception of the Nutritional Information	0.827
Motivations in Dietary Decisions	0.762
Awareness	0.721
Interest in Nutritional Attributes	0.742

Table 4 provides Cronbach's alpha values for the four retained components: perception of nutritional information, motivations in dietary choices, awareness, and interest in nutritional attributes. Cronbach's alpha is a metric of internal consistency, indicating the extent to which the items within each component correlate with one another. In this context, all four components exhibit notably good levels of internal consistency, ranging from 0.721 to 0.827 (Hair Jr et al., 2019). Importantly, all values surpass the established threshold of 0.7, affirming that the items within each component effectively measure the intended underlying constructs (Peterson, 1994). This indicates a robust level of reliability in the assessment of these components within the study.

4. CONCLUSION

The study highlights various factors affecting the use and understanding of nutrition labeling on food labels among Nepalese youths. Of the total respondents 24% reported that they always read the nutrition labeling on food labels. It also reveals that perceptions regarding nutritional information's clarity and accessibility significantly impact the comprehension of labels, indicating the need for clearer and more legible labeling practices. Additionally, motivations driving dietary choices play a crucial role, emphasizing the importance of encouraging health-conscious habits among youths. Awareness about the accuracy of nutritional information emerges as pivotal, indicating the need for reliable and trustworthy data for informed decision-making. Finally, the substantial priority placed on health in dietary decisions signifies a positive inclination towards healthier choices, despite potential cost implications. These insights underscore the importance of tailored interventions and clearer labeling practices to empower Nepalese youths towards more informed and health-conscious dietary decisions for their well-being.

The study outlined in this paper possesses certain limitations that pave the way for future research endeavors. The cross-sectional nature of the data restricts the establishment of causal relationships among variables. To overcome this limitation, forthcoming research could explore longitudinal data, experimental methodologies, and other advanced techniques to address this issue.

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