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NUTRITION LABEL KNOWLEDGE, SIGNIFICANCE AND ITS USE AMONG UNIVERSITY STUDENTS

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To study the knowledge and frequency of use of nutrition labels among 18 to 25 years old university students. A total of n = 222 subjects were recruited using simple random sampling technique. Students across 9 institutes of Undergraduate and Post graduate studies participated on voluntary basis. Data on knowledge and frequency of use of nutrition labels, its importance and factors influencing purchasing of packaged foods was collected through an interview method using structured questionnaires. Statistical analysis included descriptive statistics, chi-square and correlation tests. 64.4% of the subjects found the contents on the nutrition labels to be important whereas 63.0% of the subjects found it easy to understand the nutrition labels. A negative Person's correlation was found between increasing daily consumption of packaged foods in relation to ease of understanding of the nutrition labels ($R = -0.127$, $p = 0.05$). Significant results across graduation levels of the subjects and knowledge about nutrition labelling ($\chi^2 (1, N = 222) = 0.039$, $p = 0.4$) were observed. The study revealed that level of graduation of students influenced the knowledge related to nutrition labelling and consumption of packaged foods. It is thereby necessary to educate students about nutrition labelling and its use to influence their consumption of unhealthy food products.

Keywords: Nutrition labelling, Packaged foods, University students

INTRODUCTION

Nutrition labelling is defined as “any words, particulars, trademarks, brand names, pictorial matter or symbol relating to food stuff and placed on any packaging, document, notice, ring or collar accompanying or referring to such foodstuff^[1]. Nutrition labelling is a fact statement of the energy amount and nutrients on the food product's label. The nutrition label provides nutrition information that helps consumers on food choices. The use of nutrition fact label among the consumers depends on several factors. Basic knowledge in nutrition is essential for consumers to understand the use of nutrition facts on the label for choosing a healthy diet. Consumers with good nutrition knowledge are more likely

to use the nutrition label when shopping for foods^[2]. Nutrition knowledge can be defined as the knowledge of concepts and processes related to nutrition and health including knowledge of diet and health, diet and disease, foods representing major sources of nutrients, and dietary guidelines and recommendations. Nutrition information on food labels could be a cost-effective method of communicating nutrition information to consumers because the information appears at the point of sale for most packaged foods^[3].

The knowledge and use of nutrition labels can help consumer make healthy choices which may delay the predisposition of development of chronic diseases.

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Consumer behaviour refers to the selection, purchase and consumption of goods and services for the satisfaction of their wants. Consumer's buyer behaviour and the resulting purchase decision are strongly influenced by cultural, social, personal and psychological characteristics. An understanding of the influence of these factors is essential for marketers in order to develop suitable marketing mixes to appeal the target customer. Consumers are attracted in buying healthful foods and beverages from the use of food label for satisfying personal health goals (Manwa, 2013).

Labelling statements on the food product can make consumers better informed and more health conscious. Currently, it is familiar that many disease are diet related and can be controlled or prevented through an appropriate diet and therefore to change eating pattern, sufficient information such as nutritional information must be provided at the point of purchase and thus it can make the whole concept of healthy eating simpler and useful for making better food choices. There are many factors being considered during buying the food products such as packaging, price, taste and nutritional labelling (Nurliyana *et al.*, 2011).

The students represent the future decision maker in organisations, communities, and countries. University years are a period where student increasingly makes independent choices about their lifestyle and health practices (Preamble to the constitution of the world health organization, 1946). However, the period also encompasses stresses for students trying to achieve success in their academic goals despite the financial constraints that many report (Snooks, 2009). During the transition from secondary school to university, students need to adapt to a new environment (Young and Nestle, 2002; and Story and Stang, 2005). Food consumption patterns of university students are of concern because students tend to skip meals, eat diets excessively high in fat and refined sugars and also avoid certain types of nutritious foods. Therefore basic nutrition knowledge related to nutrition labelling is must. Thus the research objectives proposed to study the knowledge and frequency of use of nutrition labels among 18 to 25 years old university students.

MATERIALS AND METHODS

Study Design and Sampling Technique

A cross-sectional study was carried out among full time university students between the age group 18-25 years using simple random sampling. Students across 9 institutes of undergraduate and post graduate studies participated on

voluntary basis. A total of 250 students were studied. However 28 students were excluded since the questionnaires filled were incomplete. Therefore total of 222 participants were included in the present study.

Data Collection Tools

Data was collected through an interview method using structured questionnaires before which a preliminary study was conducted on 30 participants after their consent. Later few changes were made to the original questionnaire based on the shortcomings.

Final questionnaires were administered to study knowledge about nutrition labels, frequency of use of nutrition labels, its importance and factors influencing purchasing of packaged foods by university students.

Form A—General Information Questionnaire

This questionnaire comprised of general information of the study participant including age of the participants, gender of the subject, graduation level of the subject, BMI category of the subject.

Form B—Food Frequency Questionnaire

This questionnaire included foods from various food groups (cereals, pulses, milk and its products, fruits and vegetables) to get a glimpse of the quality of diet consumed and frequency for the same. This questionnaire included healthy as well as unhealthy foods like carbonated beverages, fried foods like vadapav, samosa, and packaged foods like chiwada, wafers, etc.

Form C—Nutrition Labelling Questionnaire

The questionnaire investigated the frequency of comparing food labels among the participant. They were asked to compare two nutritional labels and the state the healthier option among the two samples by which students' knowledge on nutritional labelling was recorded.

Form D—Frequency of Use of Nutrition Labels Questionnaire

This comprised of frequency of reading the specific contents on nutrition label, ease of understanding and importance of a nutrition label, knowledge about nutrition labels, factors influencing purchase of packaged foods and significance of nutrition labelling.

Ethical Consideration

The present study was reviewed under the Research

Advisory Committee (RAC) at the university level. Entry on the study was on voluntary basis and participation was done only after their informed, signed consent was given.

Statistical Analysis

Data was double entered into SPSS version 22.0 for analysis and before analysis data was cross checked for errors, if any. Frequencies under different category were computed. Chi-square test was applied for testing the significance in proportion and correlation tests were applied to find any significance in association. For all analysis level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

The results have been categorised as follows:

Variable	Frequency (n)	Percentage (%)
Age group		
18-20	98	44.1
21-23	80	36
24-25	44	19.9
Total	N=222	100
Gender		
Male	89	40.1
Female	133	59.9
Total	N=222	100
Graduation level		
UG	110	49.5
PG	112	50.5
Total	N=222	100
BMI category		
>18.5 underweight	35	15.8
18.5-22.9 normal weight	80	36
23.0-27.4 pre obese	84	37.8
27.5- 32.4 obese class 1	21	9.5
32.5-37.4 obese class 2	2	0.9
Total	N=222	100

The total numbers of participants in the present study were 222. Out of which maximum number of participants were in the age group of 18-20 yrs with the mean age of 21.22 ± 2.15 years. The percentage of female participants (59.9%) was higher than male participants (40.1%) during data collection for the present study.

The BMI was calculated based on the anthropometric data. Participants were grouped under standard BMI categories prescribed by World Health Organisation, 2004. Overall the study population had a mean BMI of 22.60 ± 3.67 .

As per the above table, 61.3% of the participants perceived their weight to be normal. 28.4% of the participants perceived themselves as overweight while 10.4% of the participants perceived themselves to be underweight. However, based on the anthropometric data and computed standard BMI categories as per Table 1: 36.0% were considered normal weight, 48.2% were overweight and obese and 15.8% were underweight. This shows that there is wide discrepancy in the weight perceived by the participants as compared to their actual weight. 25.3% of the have over-reported their weight perception of being normal weight and 19.8% of the participants have underreported their weight perception of being overweight. Thus body image perception is an internal cue for making healthy and unhealthy choices, if weight is perceived to be normal it may lead an individual to make unhealthy choices.

Descriptive Statistics				
	N	Minimum	Maximum	Mean \pm Std. Deviation
BMI	N = 222	15.14	34.53	22.60 \pm 3.67

Subject's Weight Perception	Frequency (n)	Percent (%)
Underweight	23	10.4
Normal weight	136	61.3
Overweight	63	28.4
Total	N = 222	100

Knowledge on Nutrition Labels

20.7% participants exclusively referred to internet as their source for information on matters of health followed by family (13.5%). Newspapers exclusively were reported to be least referred source (1.4%) for the same. However, 41.9% of participants reported multiple choices, i.e., they looked for the information on matters of health through different combination of sources available (e.g., Doctors + family + Internet).

64.2% participants exclusively reported by reading labels (19.8%) followed by internet (15.3%) as their resource to gain knowledge on nutrition labels. Nutrition articles (4.5%) and peers (3.6%) were least reported.

Source of Information on Matters of Health	Frequency (n)	Percent (%)
Television	13	5.9
Magazines	11	5
Newspapers	3	1.4
University/school training/courses/gyms	11	5
Family	30	13.5
Doctors	15	6.8
Internet	46	20.7
Multiple Choices	93	41.9
Total	N = 222	100

Gain Knowledge on Nutrition Labels	Frequency (n)	Percent (%)
By reading labels	44	19.8
Family	32	14.4
Peers	8	3.6
Nutrition articles	10	4.5
Magazines or health books	13	5.8
Internet	34	15.3
Other (e.g.: Dietician, Gym trainer)	2	0.8
Multiple Choices	79	35.8
Total	N = 222	100

However, 35.8% of participants reported multiple choices, i.e., they looked for the source to gain knowledge with regards to nutrition labelling through different combination of sources available (e.g., Family, Magazines or Health books + Internet).

Food Frequency Data

56.3% of the study population preferred non vegetarian foods as their preference for eating out followed by 43.7% who preferred vegetarian food.

Eating Out Preferences	Frequency (n)	Percent (%)
Vegetarian	97	43.7
Non-vegetarian	125	56.3
Total	N = 222	100

Frequency of Consumption of Healthier Choices of Foods

Daily consumption of wheat and its products (73.4%) and pulses and legumes (50.0%) was high. Since they comprise of Indian diet, it is suggestive that majority of the participants did consume a healthy meal. Participants who consumed breakfast cereals' more than 5-6 times a week, (36.9%) and those who 'never' (39.6%) consumed are similar. 45.5% of the participants reported to 'never' consume soya and its products. 47.7% of participants consumed milk daily which is less compared to beverage consumption (68.9%) which are made using milk (e.g., Tea, coffee, etc).

Frequency of Consumption of Unhealthy Choices of Foods

Participants reported consumption of carbonated beverages (46.4%), fried foods (52.7%) and packaged foods (44.1%) to be 'more than 5-6 times a week' which is considered unhealthy.

Highly significant difference in proportion of consumption of fried food across gender was found. ($\chi^2 = 0.46$, p-value = 0.48).

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Table 7: Frequency of Food Consumption

Food Group	Serving Size (g/ml)	Daily		3 Times a Week		More than 5-6 Times a Week		1- 2 Times a Week		Never	
		N = 222	(%)	N = 222	(%)	N = 222	(%)	N = 222	(%)	N = 222	(%)
Rice & its Products	30 g	92	-41.4	18	-8.1	82	-36.9	22	-9.9	8	-3.7
Wheat & its Products	30 g	163	-73.4	10	-4.5	22	-9.9	22	-9.9	5	-2.3
Breakfast Cereals	30 g	32	-14.4	9	-4.1	82	36.9	11	5	88	39.6
Pulses & Legumes	30 g	111	-50	29	-13.1	46	20.7	25	11.3	11	5
Soya Products	30 g	22	-9.9	7	-3.2	82	-36.9	10	-4.5	101	-45.5
Milk	150 ml	106	-47.7	18	-8.1	44	-19.8	21	-9.5	33	-14.9
Milk Products	50 g	50	-22.5	41	-18.5	90	-40.5	32	-14.4	9	-4.1
Leafy Vegetables	100 g	52	-23.4	27	-12.2	106	-47.7	19	-8.6	18	-8.1
Starchy Vegetables	100 g	57	-25.7	51	-23	77	-34.7	26	-11.7	11	-5
Other Vegetables	100 g	79	-35.6	38	-17.1	70	-31.5	23	-10.4	12	-5.4
Fresh Fruits	50 g	54	-24.3	41	-18.5	87	-39.2	23	-10.4	17	-7.7
Dry fruits	15g	59	-26.6	28	-12.6	75	-33.8	16	-7.2	44	-19.8
Beverages	150ml	153	-68.9	7	-3.2	27	-12.2	25	-11.3	10	-4.5

Table 8: Frequency of Consumption of Unhealthy Choices of Foods

Food Group	Serving Size (g/ml)	Daily		3 Times a Week		More than 5-6 Times a Week		1- 2 Times a Week		Never	
		N = 222	(%)	N = 222	(%)	N = 222	(%)	N = 222	(%)	N = 222	(%)
Carbonated Beverages	250 ml	33	-14.9	20	9	103	-46.4	11	-5	55	-24.8
Fried Foods	1 (no.)	38	-17.1	31	14	117	-52.7	14	-6.3	22	-9.9
Packaged Foods	100 g	32	-14.4	30	13.5	98	-44.1	21	-9.5	41	-18.5

found ($\chi^2 = 0.000$, p-value = 0.000). A significant relation between increasing BMI category and carbonated beverages consumption was found ($R = -0.217$, p-value = -0.001)

Use of Nutrition Labels

35.6% of the participants never compared labels while 7.2% always compared the labels for different brands.

Participants were asked to analyze the following food labels and asked to determine the healthier option among the two to test their knowledge on nutrition labelling.

The results for those who identified the healthier option were as follows:

68% of the participants answered incorrectly while 32% could correctly identify the healthier option among the two samples.

Highly significant results were observed among the graduation level of the participants and their knowledge about nutrition labelling by choosing healthier option among the two samples ($\chi^2 = 0.39$, p-value = 0.055). Similar effects have been observed for education levels, individuals with greater education have reported greater use of nutrition labels in most studies with only two exceptions (Campos *et al.*, 2011).

64.4% of the participants found the contents on the nutrition label to be important. 26.1% found the importance

Table 9: Chi- Square of Consumption of Fried Foods Across Gender

Association of frequency of fried food consumption across genders					
Frequency of Consumption	Male	Female	Total	χ^2 value	p-value
Never	22	16	38	0.46	0.48*
1-2 times a week	38	79	117		
3 times a week	13	18	31		
More than 3 times a week	8	6	14		
Daily	8	14	22		
Total	89	133	222		

Note: *Significant at 5% level.

Table 10: Chi-Square of Carbonated Beverages Across Gender

Association of frequency of fried food consumption across genders					
Frequency of Consumption	Male	Female	Total	χ^2 value	p-value
Never	24	9	33	0	0.000**
1-2 times a week	37	66	103		
3 times a week	12	8	20		
More than 3 times a week	5	6	11		
Daily	11	44	55		
Total	89	133	222		

Note: **Significant at 1% level.

Table 11: Correlation of Carbonated Across BMI Category

		R-value	p-value
Which BMI category does the subject comes in?	Frequency of carbonated beverages consumption	-0.217	.001**

Note: **Significant at 1% level.

to be average while 9.5% of the participants found it not important.

Even though 63% of the participants found it easy to understand the nutrition labels, 68% of the participants interpreted the nutrition labels incorrectly. 32% of the

Table 12: Frequency of Comparison of Food Labels

Comparing Food Labels	Frequency (n)	Percent (%)
Always	16	7.2
Often	25	11.3
Sometimes	61	27.5
Rarely	41	18.5
Never	79	35.6
Total	N = 222	100

Figure 1: Healthier Option among the Two Samples

Label-A	
Nutrition Information	
Per 100 g of Product	
Energy (Kcal)	478
Protein (g)	8.4
Carbohydrates (g)	67.4
Of which sugars (g)	10.1
Fat (g)	19.4
*Approximate Values	
Label- B	
Nutrition Information	
Per 100 g of Product	
Energy (Kcal)	483
Protein (g)	6.7
Carbohydrates (g)	71.6
Of which sugars (g)	31.9
Fat (g)	18.9
Hydrogenated vegetable oil used – contains trans fats	
*Approximate Values	

participants were correct in interpreting the healthier option among the 2 samples.

A negative Pearson's correlation was found between increasing daily consumption of packaged foods with relation to the ease of understanding of the nutrition labels. Those consuming higher amounts of packaged foods

Figure 2: Healthier Option among the Samples

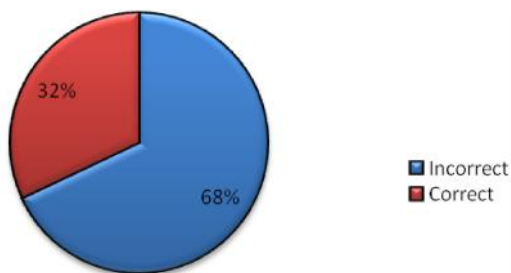


Table 13: Chi- Square of Healthier Option among the Samples Across Graduation Level

Healthier Option among Samples	Course and year of the subject			χ^2 -value	p-value
	UG	PG	Total		
Incorrect	82	69	151	0.039	.055*
Correct	28	43	71		
Total	110	112	222		

Note: *Significant at 5% level.

Table 14: Importance of Content on the Nutrition Label

Importance of Content on Nutrition Label	Frequency (n)	Percent (%)	
Lowest	6	2.7	9.50%
Lower	15	6.8	
Average	58	26.1	
Higher	77	34.7	64.40%
Highest	66	29.7	
Total	N = 222	100	

Table 15: Ease of Understanding of the Label

Ease of Understanding of the Label	Frequency (n)	Percent (%)	
Lowest	10	4.5	9.00%
Lower	10	4.5	
Average	62	27.9	
Higher	80	36	63.00%
Highest	60	27	
Total	N = 222	100	

Table 16: Associations Between Daily Consumption of Packaged Foods and Ease of Understanding Nutrition Labels

		R-value	p-value
Daily consumption of packaged foods	Ease of understanding of the label	-0.127	0.05

Table 17: Reasons for Not Reading Nutrition Labels

Reasons	Frequency (n)	Percent (%)
Lack of time	17	18.4
Difficult to understand	7	7.7
Laziness	38	41.3
Not important	28	30.4
Other	2	2.2
Total	N = 92	100

reported it difficult to understand nutrition labels (R = -0.127, p-value = 0.050).

'Laziness' (41.3%) was highly reported as the reason for not reading nutrition labels followed by 'Not important' (30.4%) and 'Lack of time' (18.4%). 'Difficulty to understand' (7.7%) was the least reported reason for not reading nutrition labels. According to Driskell *et al.*^[11] the most frequently selected reasons for using nutrition label were because have general knowledge (51.7%), concern about overall health (49.2%), calorie counting (46.7%) and concern about certain nutrient (43.3%). This shows that the reasons why the student use nutrition label on food label because they understand the information on the label. Yet, the factors why do the students do not refer food label was time constrain or limited time (55.9% students) and the label was not attractive and confusing (38.6%). This finding had a similar finding as previous study conducted by Conklin *et al.* (2005), stated that the time pressure may influence the use of nutrition information. It supported by Barreiro-Hurle *et al.* (2010) which state that the use of food label is influences by economic conditions and time constraints. All of these findings show that the majority of the consumers have limited time to read the food label and understand it during buying food product.

Nutrients highly searched by the participants included fats (44.1%) followed by calories (35.6%) and proteins

Table 18: Frequency of Nutrients Searched on a Nutrition Label

Nutrients	Always		Often		Sometimes		Rarely		Never		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Calories	47	35.60%	29	22%	34	25.70%	12	10%	10	7.60%	132	100
Proteins	46	34.80%	32	24.40%	30	22.70%	16	12.10%	8	6%	132	100
CHO	30	22.70%	26	19.70%	47	35.60%	19	14.30%	10	7.70%	132	100
Sugars	38	28%	23	17.40%	40	30.30%	19	14.30%	12	10%	132	100
Fats	58	44.10%	23	17.40%	27	20.40%	16	12.10%	8	6%	132	100
Dietary Fiber	36	27.20%	20	15.10%	42	31.80%	25	19.10%	9	6.80%	132	100
Sodium/Salt	27	20.40%	16	12.10%	42	31.80%	30	22.70%	17	13%	132	100
Vitamin	34	25.70%	16	12.10%	43	32.60%	21	16%	18	13.60%	132	100
Mineral	29	22%	17	13%	38	28.70%	29	22%	19	14.30%	132	100
Any Other	1	0.70%	1	0.70%	3	2.30%	3	2.30%	124	94%	132	100

(34.8%) whereas least search nutrients included mineral content (14.3%) vitamin content (13.6%) and, sodium/ salt (13.0%) in the nutrition label. The study population seems to more aware about nutrients such as fats, calories and proteins which may influence their choices of food affecting their eating behaviour. The other nutrients reported by participants include cholesterol content, trans fats and soluble fibre. Previous studies have reported an association between label use and lower fat consumption. Label users are also more likely to eat healthier varieties of foods and to have reduced Na cholesterol and energy intakes, coupled with increased fibre, Fe and vitamin C intakes (Campos *et al.*, 2011).

Significant differences were observed between the graduation level of the student (UG/PG) and their frequency of search for caloric content on the nutrition label ($\chi^2 = 0.004$, p-value = 0.003).

Factors Influencing Purchase of Packaged Foods

38.7% participants reported exclusively taste (17.6%) and nutritional/ health claims (8.1%) as factors affecting their purchase of packaged foods. Advertisements (5.4%) and brand loyalty (4.5%) were also reported. Availability of foods (1.8%) and price (1.3%) were reported to be least influential factor for purchasing packaged foods. However, 61.3% of

Table 19: Chi- Square of Searching Calories in Nutrition Labels across Graduation Level

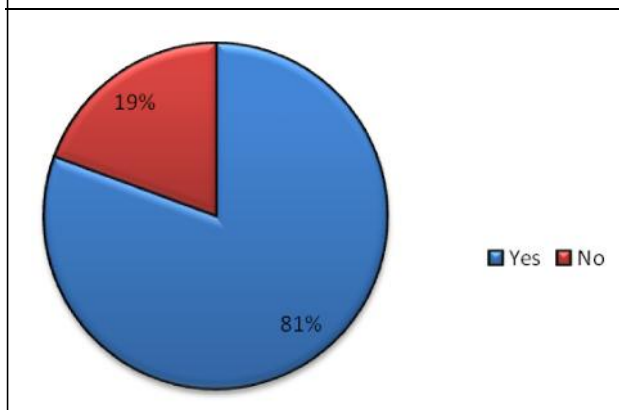
Search for Calories	Course and year of the subject				
	UG	PG	Total	χ^2 -value	p-value
Always	18	29	47	0.004	.003*
Often	22	7	29		
Sometimes	19	15	34		
Rarely	3	9	12		
Never	3	7	10		
Not applicable	45	45	90		
Total	110	112	222		

Note: *Significant at 5% level.

Table 20: Factors Influencing Purchase of Packaged Foods

Factors Influencing Purchase of Packaged Foods	Frequency (n)	Percent (%)
Price	3	1.3
Taste	39	17.6
Availability	4	1.8
Advertisements	12	5.4
Nutritional/health claims	18	8.1
Brand loyalty	10	4.5
Multiple choice	136	61.3
Total	N = 222	100

Figure 3: Sufficiency of Information on the Food Label



participants reported multiple choices, i.e., they reported a combination of factors that influence the purchase of packaged foods (e.g., price + taste + convenience or purchasing + peer group).

Table 19 37.8% participants reported that price doesn't influence their food choices while 33.8% reported that it does which is congruent with the table above suggesting price to be least influential factor affecting eating behaviour. According to Harnack *et al.* (2008) found that taste was the most highly factors rated when buying food from groceries. It is supported by Drichoutis *et al.* (2006) and Goodman *et al.* (2011). Furthermore, the research done by Aktas *et al.* (2009), revealed that there is significant different between the educational level of the university graduated students and the criteria they concern while purchasing like package, brand, contents, production date, expiry date, nutritional value and healthfulness. However, this study shows that expiry date was the higher factors when buying food product among students followed by taste, ingredient, price, nutrient content and lastly was packaging (21.6%). This may because of the students more aware about the safety of the food compared to taste and price which may not healthy and costly. It can see that nutrient content of the food not the higher factors during buying.

81% participants find the information given on food label as sufficient while 19% participants find the information insufficient. Among the 19% participants, suggestions for the insufficient information were given. They are as follows: Mention the method of preparation, allergies and preservatives with their side effects, Full information should be given or important information is not highlighted, Lack of trust on Indian products, Labels should be self- explanatory, Values are not accurate, need

to be more specific. Several studies have reported greater effectiveness for labels using graphics and symbols, adjective labels and labels with minimal numerical content (Campos *et al.*, 2011).

CONCLUSION

The study revealed that more than half of the participants exclusively reported by reading labels followed by internet as their resources to gain knowledge on nutrition labels. Nutrients highly searched on a nutrition label by the participants included fats followed by calories and proteins. Based on the findings of the present study, it can be concluded that level of graduation of students influenced the knowledge related to nutrition labelling and consumption of packaged foods. It is thereby necessary to educate students about nutrition labelling and its use in day to day living which may directly influence their consumption of unhealthy food products and its subsequent effects on health.

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