UNDERSTANDING AWARENESS OF YOUNG ADULTS ON DIETARY PHYTOCHEMICALS: A PILOT STUDY

Nita Ann Johnson[a], S. Kowsalya[b]
[a, b] Department of Food Science and Nutrition, Avinashilingam Institute for Home Science and Higher Education for Women, Tamil Nadu, India

Abstract

Background: This pilot study was conducted to assess the knowledge about phytochemicals among young adults to understand the need for upholding the existing dietary guidelines for Indians which encouraged consumption of vegetable foods as one of the measures to control lifestyle obesity. **Materials & Methods:** A cross-sectional study design with snowball sampling of 90 subjects aged 18 to 35 years was implemented. This study includes data from Southern and Western Indian States. Data had to be collected using Google Forms due to the restrictions of Covid-19 on human interaction as per specified safety guidelines. **Results:** Although 63.33 percent knew about phytochemicals, only 41.11 percent were aware of dietary phytochemicals with 38.88 percent accepting that it may be beneficial to them. 64.44 percent did not know about the different foods that included dietary phytochemicals with 10 percent only acknowledging phytochemicals for their anti-cancer properties. 71.11 percent failed to identify the different types of dietary phytochemicals and 97.77 percent admitted that they wanted to learn more about the role that phytochemicals played in their health. **Conclusion:** Although obesity can result from many genetic and environmental factors, understanding the role of diet-related factors for its regulation will go a long way in diminishing chances of future generations becoming obese, thereby leading to a healthier population.

Keywords : obesity, phytochemicals, diet regulation, knowledge assessment, pilot study

Corresponding author email: registrar@avinuty.ac.in

1. Introduction

Obesity is one of the widely-seen causes of morbidity and mortality and is also closely associated with diabetes mellitus, cardiovascular disorders and different cancers in adults[2]. Phytochemicals (PCs) are non-nutrient bioactive compounds present in fruits, vegetables, whole grains and cereals and other plants. Some phytochemicals have anti-inflammatory actions which exert an effect on obesity. For example, polyphenols and flavonoids suppress fatty acid synthesis and increase mitochondrial oxidation, catechins protect against high-fat-diet-induced obesity, and anthocyanins reduce weight gain while improving the metabolism of blood glucose[1]. According to Koche et al., phytochemicals have not been classified. However, they do have some significant classes namely, phenolic compounds (PPAs, FLVs and the like have anti-oxidant, anti-cancer, anti-microbial and vasodilating properties), terpenoids and steroids (carotenoids, camphor, retinol, lycopene and the like have anti-microbial, detoxifying and anti-malarial properties), alkaloids (nicotine, anabasine, quinine and the like have sedative, anti-insects and anti-cancerous properties)[3]. Different food groups are known for different phytochemicals. Grains and cereals have tocopherols which are anti-cancerous, anti-diabetic and anti-atherogenic while vegetables and fat have sterols, linoleic acids offering the same properties. Green leafy vegetables (GLVs), fruits and orange and yellow vegetables have carotenoids, flavonoids and vitamin-C. Simultaneously, pulses and the vegetables of the cruciferous family (cauliflower, broccoli, cabbage and the like) have isothiocyanates (a class of terpenoids). Pulses, nuts and oilseeds also have tocopherols and carotenoids[4][6]. Curcumin which is a major bioactive component of Turmeric has been used to treat respiratory disorders, circulatory system diseases and cancers[7]. Some phytochemicals in fruits and vegetables have even been considered for their properties in maintaining oral hygiene and health[5]. Thus, it becomes essential to know how far the upcoming generation of young adults is informed about dietary phytochemicals (DPCs), their benefits towards obesity and general health.

2. Materials and Methods

A notice describing the specific objectives and terms of participation was created and e-mailed to prospective participants (in the authors' contacts) of the age group 18 to 35 years. After informed consent (a reply e-mail from the participants) was obtained, a pre-tested (N=10) online survey form (created with Google Forms and shared using Google Drive) was e-mailed to the participants. The time interval to fill up the form was one week, i.e. eight days from its receipt. The online survey collected data under three sections – socio-demographic details, food preferences and awareness about phytochemicals. The first section included questions on the year of birth (to group into age groups), gender (to group into categories to assess representation from each gender), level of literacy (whether they had just finished school, graduation or post-graduation) and family type (whether they stayed alone, in a hostel or NFs or JFs). The second section asked about their preferences for vegetarian versus non-vegetarian foods, the number of meals they have every day and the meals that were most likely to have vegetables in them. The final section included queries about the definition of both PCs and DPCs, whether they were good or bad for the general health of the participants, PCs present in the seven food groups (milk and milk products, pulses, meat and meat products, GLVs and other vegetables, fruits, fat and sugar), types of DPCs, benefits of PCs towards health and the willingness of the participants to learn more about the topic. Out of the 97 participants who took part in the survey, seven participants and their responses were removed due to incomplete responses, non-adherence and request for withdrawal from the study. The responses obtained were then quantitatively assessed and analysed using the Microsoft Excel 2007 Software.

3. Results and Discussion

The present study revealed the awareness or the lack thereof about PCs, DPCs and their reputed benefits seen among young adults aged 18 to 35 years.

3.1 Socio-demographic Factors

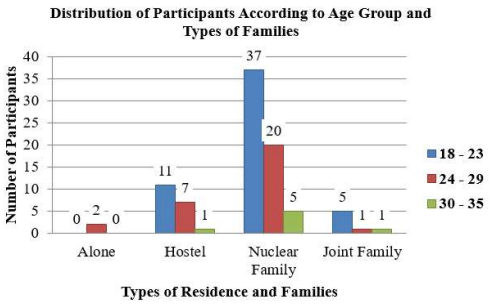
Table-1 shows the participants' distribution according to age and gender. The highest participation was from the age group of 18 to 23 years out of which female participants outnumbered the males by 42.22 percent. The mean and the standard deviation (Mean ± SD) for the first, second and third age groups were 20.70±1.69, 25.2±1.56 and 31.5±1.71, respectively.

Table-1: Distribution of Participants According to Age and Gender

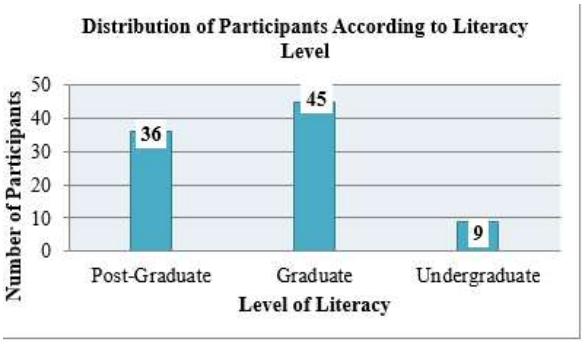
Age Group	Total (N=90)	%	Male (N=26)	%	Female (N=64)	%
18 – 23	53	58.88	16	61.53	37	57.81
24 – 29	30	33.33	8	30.76	22	34.37
30 - 35	7	7.77	2	7.69	5	7.81
Total	90		26		64	
Total			90			

According to their age, the percentages of participants who stayed alone or in a hostel or as a part of nuclear and joint families have been displayed in Graph-1. This data may also prove the high (almost 70 percent) prevalence of nuclear families in today's times. It also shows that the preference of staying in a nuclear family, i.e. with parents and siblings decreases with increase in age among Southern and Western Indian states.

The pie chart below (Graph-2) shows the percentages of participants and their literacy. The categories were divided based on completion of an educational level. The lowest participation from the undergraduates could also be attributed to this (since the selected age group 18 to 35 years).



Graph-1: Distribution of Participants According to Age Group and Types of Families



Graph-2: Distribution of Participants According to Literacy Level

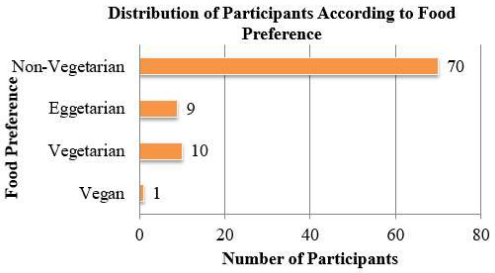
3.2 Food Behaviour

Graph-3 represents the distribution of study participants according to their preferences of being vegetarian (Veg.) and non-vegetarian (Non-veg.) foods ranging from vegan (purely plant-based consumption) to non-vegetarian (both plant and animal-based consumption). The highest percentage of Non-vegetarians could be due to the present study's locale, i.e. India's Southern and Western states. As displayed in Table-2, some participants followed different meal patterns ranging from one meal a day to seven meals a day. The seven meal pattern included an early-morning snack, breakfast, mid-morning snack, lunch, evening snack, dinner and post-dinner snacks. The most popular type of meal pattern was

of the four and five meals per day. Despite this, the majority also said that only two meals had vegetables in their respective meal patterns in a day.

Table-2: Distribution of Participants According to Perception of Vegetables in Daily Meal Pattern

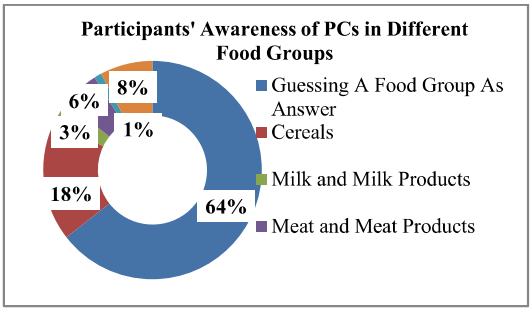
No. of Meals Per Day	Meals Including Vegetables Per Day				
	1	2	3	4	Total (N=90) (%)
1	1 (33.33)	1 (33.33)	-	1 (33.33)	3
2	-	2 (100)	-	-	2
3	1(7.69)	7 (53.84)	5 (38.46)	-	13
4	1 (2.70)	18 (48.64)	15 (40.54)	3 (8.10)	37
5	1 (3.84)	9 (34.61)	14 (53.84)	2 (7.69)	26
6	-	4 (57.14)	3 (42.85)	-	7
7	-	-	2 (100)	-	2
Total	4	41	39	6	90



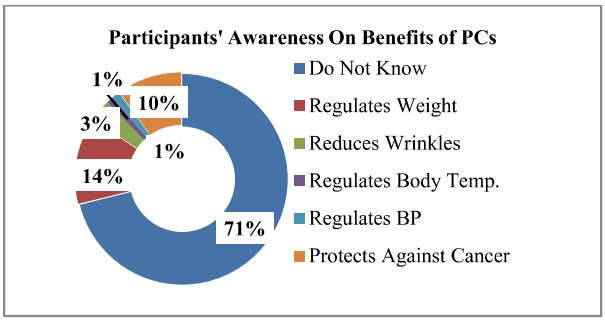
Graph-3: Distribution of Participants According to Food Preferences

3.3 Awareness on Phytochemicals

The extent of general awareness on phytochemicals and dietary phytochemicals were assessed by asking the participants about their definition and whether they knew if phytochemicals would have detrimental or beneficial effects on their person. Thirty-seven percent admitted that they did not know about phytochemicals while 29 percent said they had only heard about it as a word. Even though 41 percent said that they know about dietary phytochemicals, whether they answered the question with the notion of dietary phytochemicals as 'a type of toxic chemical' could not be determined. However, this could be safely assumed because 57 percent of the participants felt unsure about phytochemicals being good or bad for them. When asked which food groups were likely to have dietary phytochemicals, 58 percent of the participants admitted that they would rather guess their answers. In comparison, 27 percent chose the correct answer of plant-based food groups of cereals, pulses, GLVs, and other vegetables. It was interesting to note that (see Graph-4) not even one participant thought that the fat food group (including oils, butter, ghee) would have beneficial phytochemicals, while a 33 percent and 55 percent thought that animal products (such as milk and meat respectively) would have phytochemicals. This finding also supports our previous assumption that phytochemicals could easily be confused with 'toxic or harmful chemicals' by uninformed participants. When given a choice, between the phytochemicals (PPAs, CRTs, OGSs, TRPs, PTSs, FLVs, CCU and TCNs) and asked to select the one with the maximum types of PCs, 74 percent out-rightly denied knowing about them, and 16 percent correctly chose PPAs which are known as the largest class of phytochemicals.



Graph-4: Distribution of Participants Based On Awareness of Phytochemicals in Different Food Groups



Graph-5: Distribution of Participants Based On Awareness of Phytochemical Benefits

Graph-5 represented the distribution of participants based on their awareness about phytochemical benefits. This query was met with a 100 percent response rate, but most participants felt that phytochemicals did a better job at regulating body weight than protecting against cancer risks. However, 71.11 percent preferred to say that they didn't know about phytochemicals' benefits.

As a final query to determine their participation for future studies, especially concerning education about dietary phytochemicals and their health benefits, eighty-eight out of the ninety participants agreed that they would be 'very interested.'

4. Conclusion

Although at first look, it seems like there is a slight majority who are aware of phytochemicals, there are some probable reasons for an almost equal percentage of the participants who are not. Those who may have had probable exposure to food science – through academic learning or personal dieticians or trainers would automatically fall in the 'learned' or informed category. Since there are negligible numbers of everyday awareness or education programmes on phytochemicals and health in India, there is also significant participation from the 'unaware' or un-informed category. Even though this study provides a preliminary investigation of the level of awareness about phytochemicals, we feel that a considerable amount of time and effort will need to be spent on developing nutrition education modules based on these findings for further research in the field of phytochemicals. Although obesity can result from many genetic and environmental factors, understanding the role of diet-related factors such as the role of dietary phytochemicals for its regulation will go a long way in diminishing the future generations' chances of becoming obese, thereby leading to a healthier population.

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Conflict of Interest

The authors declare no conflict of interest.

Limitations of Study

1. Due to the snowball sampling design employed in the present study, it was not possible to control all the participants' demographics which could have prevented an accurate representation of the Southern and Western Indian states.
2. Any pre-formed ideas or experiences about phytochemicals may have influenced the participants' responses which could not have been detected using an online survey.
3. Due to India's Covid-19 safety restrictions, an online survey was used, which may not be as effective as the face-to-face interactions during offline surveys for clarifying the participants' queries when filling them up.

4. Abbreviations Used

Abbreviations	Full-Form
PCs	Phytochemicals
JFs	Joint Families
NFs	Nuclear Families
DPCs	Dietary Phytochemicals
PPAs	Polyphenols and Phenolic Acids
GLVs	Green Leafy Vegetables
CRTs	Carotenoids
OGSs	Organosulfurs

Abbreviations	Full-Form
TRPs	Terpenoids
PTSs	Phytosterols
FLVs	Flavonoids
CCU	Curcumin
TCN	Thiocyanates
Veg.	Vegetarian
Non-veg.	Non-vegetarian
Temp.	Temperature
BP	Blood Pressure

5. References

[1]. Carrera-Quintanar, L., Lopez Roa, R. I., Quintero-Fabián, S., Sánchez-Sánchez, M. A., Vizmanos, B., & Ortuño-Sahagún, D. (2018). Phytochemicals that influence gut microbiota as prophylactics and for the treatment of obesity and inflammatory diseases. Mediators of inflammation, 2018.

[2]. Dincer, Y., & Yuksel, S. (2020). Anti-Obesity Effects Of Phytochemicals From An Epigenetic Perspective. Nutrition, 111119.

[3]. Koche, D., Shirsat, R., & Kawale, M. (2016). An overerview of major classes of phytochemicals: their types and role in disease prevention. Hislopia Journal, 9, 1-11.

[4]. Okarter, N., & Liu, R. H. (2010). Health benefits of whole grain phytochemicals. Critical Reviews in Food Science And Nutrition, 50(3), 193-208.

[5]. Pavithra, R. P., & Jayashri, P. (2019). Influence of Naturally Occurring Phytochemicals on Oral Health. Research Journal of Pharmacy and Technology, 12(8), 3979-3983.

[6]. Rao, B. N. (2003). Bioactive phytochemicals in Indian foods and their potential in health promotion and disease prevention. Asia Pacific Journal of Clinical Nutrition, 12(1).

[7]. Xiao, J., Sarker, S. D., & Asakawa, Y. (Eds.). (2019). Handbook of Dietary Phytochemicals. Springer Singapore.