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Review article

Knowledge, Attitude and Practices on Consumption of Nuts among Adults.

Triveni K[1] , Edwina Raj[2]l, Geetha Santhosh[3]

[1]School of Continuing Education, Indira Gandhi National Open University, New Delhi,

[2]Senior Clinical Dietitian, Aster CMI hospital, Bangalore, Karnataka, India,

[3]Associate Professor, Department of Food Science and Nutrition, Mount Carmel College, Autonomous, Bangalore

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ABSTRACT

Background -Nuts are widely recognized for their nutritional benefits and potential contributions to overall health. However, limited research exists on individuals' understanding of nuts, their attitudes toward incorporating nuts into their diet, and the actual practices they engage in regarding nut consumption. This study aimed to assess the knowledge, attitudes, and practices related to nut consumption among 125 adults (46 females, 79 males) with an average age of 38.68. The majority of participants demonstrated awareness of the health benefits associated with nuts, with no significant gender differences. Primary health benefits identified by most respondents included nuts being a rich source of protein (51.2%) and containing omega-3 fatty acids (24.8%). A noteworthy proportion of participants believed that soaking nuts enhances nutrient absorption (53.6%) and removes phytic acid (40%), though only a small percentage (8%) associated soaking with easier chewing. Males showed a higher inclination than females to perceive soaked nuts as easier to digest. Interestingly, the study revealed that most participants (100 out of 125) believed that moderate nut consumption does not lead to weight gain, with no discernible gender difference. Almonds emerged as the most popular variety (96.8%), while Brazil nuts were theleast favored (5.6%). Females exhibited a greater preference for walnuts and pistachios compared to males. The majority of participants preferred unsalted nuts (69.6%) and tended to consume them in the mornings (68.8%). On average, a typical serving size consisted of a fistful or approximately four nuts. Glass containers were the preferred choice for storing nuts (52%), while steel containers were the least favored (12.8%). The most commonly purchased option was pre-packaged nuts from grocery stores (62.4%). Overall, participants perceived nuts as a convenient and portable snack that contributes to a balanced diet, aids in weight management, and provides satisfaction and satiety. The study highlights the importance of raising awareness and providing guidance on proper nut consumption practices. Further research should explore the prevalence of nut allergies among adults to inform interventions and promote healthier nut consumption habits. These findings contribute valuable insights into nut consumption patterns and provide guidance for future interventions focused on promoting nut consumption and addressing dietary considerations.

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Introduction

In recent years, there has been growing interest in the role of nut consumption in promoting health and well-being among adults, making it a subject of substantial research and public interest. Extensive research has been carried out on nuts and health outcomes during the last two decades since the publication of a report from the pioneering Adventist Health Study showing an association of nut consumption with a lower risk of coronary heart disease (CHD) in 1992, [1], shortly followed by the seminal clinical trial of (Sabaté et al., 1992).[2] demonstrating that a diet enriched with walnuts reduced serum cholesterol levels compared to a standard healthy diet.

The interested reader will find complete information regarding research published up to 2005 on nuts and health outcomes in a recent monograph by (Sabaté et al., 2007)[3] and up to 2007 in the proceedings of a Symposium on Nuts and Health held at the U.S. Department of Agriculture Research Laboratory in the University of California at Davis. (King et al., 2008)[4]

Corresponding author:
Dr. Edwina Raj
Senior Clinical Dietitian,
Aster CMI hospital, Bangalore,
Karnataka, India

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By definition, tree nuts are dry fruits with one seed in which the ovary wall becomes hard at maturity. The most popular edible tree nuts are almonds (Prunus amygdalin), hazelnuts (Corylus avellana), walnuts (Juglans regia), and pistachios (Pistacia vera). Other common edible nuts are pinenuts (Pinus pinea), cashews (Anacardium occidentale), pecans (Carya illinoiensis), macadamias (Macadamia integrifolia), and Brazil nuts (Bertholletia excelsa).

The consumer definition also includes peanuts (Arachis hypogea), which botanically are groundnuts or legumes but are widely identified as part of the nuts food group. In addition, peanuts have a similar nutrient profile to tree nuts. (Brufau et al., 2006, Ros et al.,2006) [5,6].

Although chestnuts (Castanea sativa) are tree nuts as well, they are different from all other common nuts because of being starchier and having a different nutrient profile. For the purpose of this review, the term "nuts" includes all common tree nuts [with the exception of chestnuts] plus peanuts.

Nuts, seeds, and pulses are all nutrient-dense foods and have been a regular constituent of mankind's diet since pre-agricultural times. In Western countries, nuts are consumed as snacks, desserts, or part of a meal, and are eaten whole (fresh or roasted), in spreads (peanut butter, almond paste), as oils, or hidden in commercial products, mixed dishes, sauces, pastries, ice creams, and baked goods.

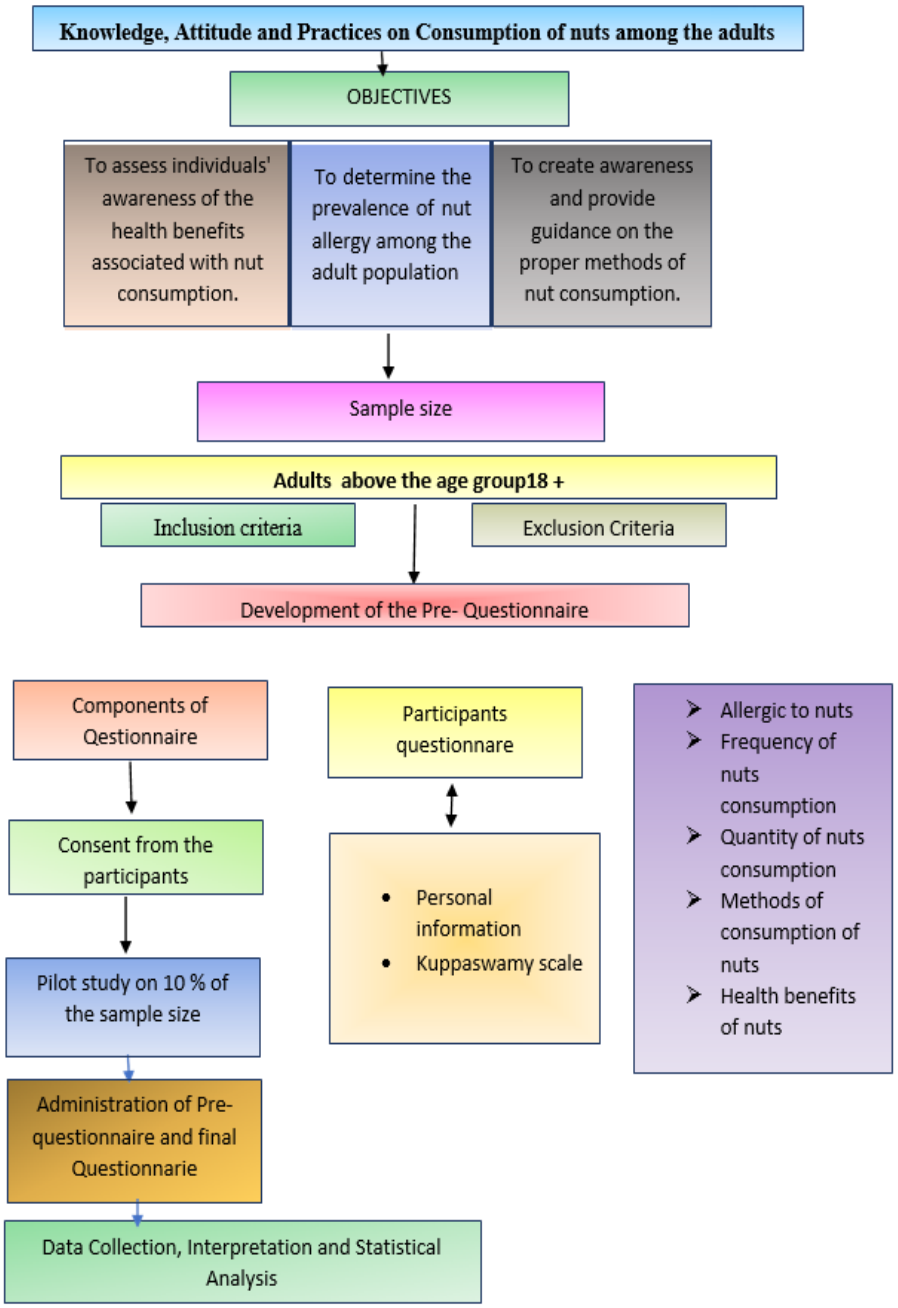
In the last century, nut consumption in most industrialized nations followed a downward trend to become only a marginal source of energy in the daily diet, except for vegetarians and other health-conscious populations, such as Seventh-Day Adventists.(Dreher et al.,1996, Sabaté et al.,1999)[7] However, nut consumption has increased in recent times in Western countries following both the inclusion of this food group in many guidelines for healthy eating and wide media coverage of recent evidence connecting nut consumption to a wide range of health benefits.

Thus, nuts have been proposed as an important component of optimal diets for the prevention of CHD by leading experts in the field,(Hu et al.,2002), [8]and in the summer of 2003, the US Food and Drug Administration issued a health claim for nuts because of the link between nut consumption and a reduced risk of both CHD and intermediate biomarkers, such as blood cholesterol. (US Food and Drug Administration2003)[9,10] Since then, nuts have become an indispensable component of healthy diets(King et al.,2008, Nash et al.,2008)[11] and are included in the American Heart Association dietary metrics for defining ideal cardiovascular health in their recent report on setting goals for health promotion and disease reduction for 2020. (Lloyd-Jones et al.,2010) [12,13]

The scientific evidence behind the proposal of nuts as cardio-protective foods stems from both epidemiological observations suggesting a consistent inverse association between the frequency of nut intake and the development of CHD(Kelly et al., 2006)[14,15] and numerous short-term clinical trials show the wing beneficial effects of nut intake on the lipid profile.

The current literature on nut consumption primarily focuses on health outcomes and nutritional value, often neglecting the factors that influence individuals' knowledge, attitudes, and practices concerning nut consumption. Therefore, this dissertation aims to investigate the factors associated with adults' knowledge, attitude, and practices related to nut consumption and explore potential barriers and facilitators to incorporating nuts into their diets.

2. Methodology



The main objectives of the study is to assess adults' knowledge regarding the nutritional value and health benefits of nuts, investigate the attitudes and perceptions of adults towards nut consumption, and examine the dietary practices and behaviors related to nut consumption among adults. By addressing these objectives, this study aims to provide a comprehensive understanding of the factors that shape adults' knowledge, attitudes, and practices in relation to nut consumption.

To achieve these objectives, several research questions addressed the level of knowledge among adults regarding the nutritional value and health benefits of and the attitudes and perceptions of adults towards incorporating nuts into their diets and the dietary practices and behaviors related to nut consumption among adults, and what factors influence these practices.

Understanding the knowledge, attitudes, and practices surrounding nut consumption among adults is crucial for developing targeted interventions and educational campaigns aimed at increasing the adoption of healthy dietary habits. By identifying the barriers and facilitators to nut consumption, this study will enable healthcare professionals, policymakers, and nutritionists to develop evidence-based strategies to promote the inclusion of nuts in adult diets, ultimately leading to improved health outcomes. By investigating the knowledge, attitudes, and practices relating to the consumption of nuts among adults, this dissertation seeks to contribute to the existing body of knowledge on nut consumption and provide practical insights that can be utilized to promote healthier dietary behaviors in adults.

3 Study Design:

The study was designed and conducted under the guidance of the Head of Department (HOD) at Aster CMI Hospital in Hebbal, Bangalore. The target population for the study included adults aged 18 years and above. The data collection period lasted for one week in May 2023.

A) Inclusion Criteria:

-Adults aged 18 years and above.

b)Exclusion Criteria:

-Individuals below 17 years of age.

-Adults who are allergic to nuts.

c)Materials and Methods:

1.Consent Form: Participants were required to sign a consent form agreeing to share their data and ensuring confidentiality.

2.An E Form: A E form survey form was created and shared with the participants. The form collected demographic details such as age, gender, income, and education. It also included open- ended questions to gather information about the participants' normal routines, food preparation methods, and feeding practices.

d)Confidentiality:

Participants were assured that their responses would be treated with strict confidentiality. By answering the questionnaire, participants provided consent for the use of their information in the study. The collected data would be used for presentations and publications while maintaining confidentiality.

e)Importance of Nut Consumption:

The study recognized the significance of nut consumption and aimed to gain a better understanding of its importance through the participation and insights provided by the adults involved.

Overall, the study employed a questionnaire-based approach using a Google survey form to collect data from consenting adults. The collected data would be analyzed, and the findings would be used for future presentations and publications while ensuring the confidentiality of participants' information.

f) Procedure involved

1. Review of existing literature

a. Conducted a systematic review of relevant literature on nut consumption, including studies on knowledge, attitudes, and practices related to nuts among adults.
b. Identify gaps and research questions that need to be addressed.

2. Research Instrument Development:

a. Developed survey questionnaires based on the findings from the literature review.
b. Included sections on demographic information, nut consumption frequency and quantity, preferred types of nuts, nut consumption as snacks and desserts, and reasons for including nuts in the diet.

3. Participant Recruitment:

a. The target population, such as adults aged 1 and above.
b. Implemented various recruitment methods to reach a diverse sample, including social media community outreach, and leveraging personal networks.
c. Ensured that the sample represents various demographic characteristics to capture a broad range of perspectives.

4. Pilot study:

A pilot study was conducted with 10% of the sample size to assess the survey data and make necessary modifications. Feedback from participants was carefully considered to enhance clarity and address any ambiguities. The refined survey instrument aimed to improve data quality, validity, and reliability. The final survey was well-structured to effectively capture knowledge, attitudes, and practices related to nut consumption among the target adult population.

5. Data Collection:

a. Administered the survey questionnaires and conduct interviews with the participants.
b. Collected both quantitative and qualitative data to obtain a holistic understanding of participants' knowledge, attitudes, and practices regarding nut consumption.
c. Ensured that the data collection procedures are standardized and consistent across all participants.

6. Data Analysis:

In the research process, we meticulously cleaned and organized the collected data, ensuring accuracy and completeness. Employing descriptive statistics, we summarized demographic characteristics, nut consumption habits, and attitudes among the participants. To delve deeper, cross-tabulations and association analyses were conducted to explore potential relationships between demographic variables and nut consumption patterns. Subsequently, we applied appropriate statistical tests to ascertain the significance of observed associations, allowing for a comprehensive understanding of the nuanced connections within the dataset.

7. Interpretation of Findings:

Upon completion of the data analysis, we delved into interpreting the findings within the context of our research questions and objectives. Through this process, key insights and patterns emerged, shedding light on the intricate relationships between demographic variables and nut consumption habits. These findings not only contribute to our understanding of the subject but also pave the way for informed decision-making. Furthermore, the identified patterns and insights hold significant implications for public health interventions and educational campaigns, providing valuable guidance for initiatives aimed at promoting healthier dietary habits and overall well-being.

4. RESULTS AND DISCUSSION

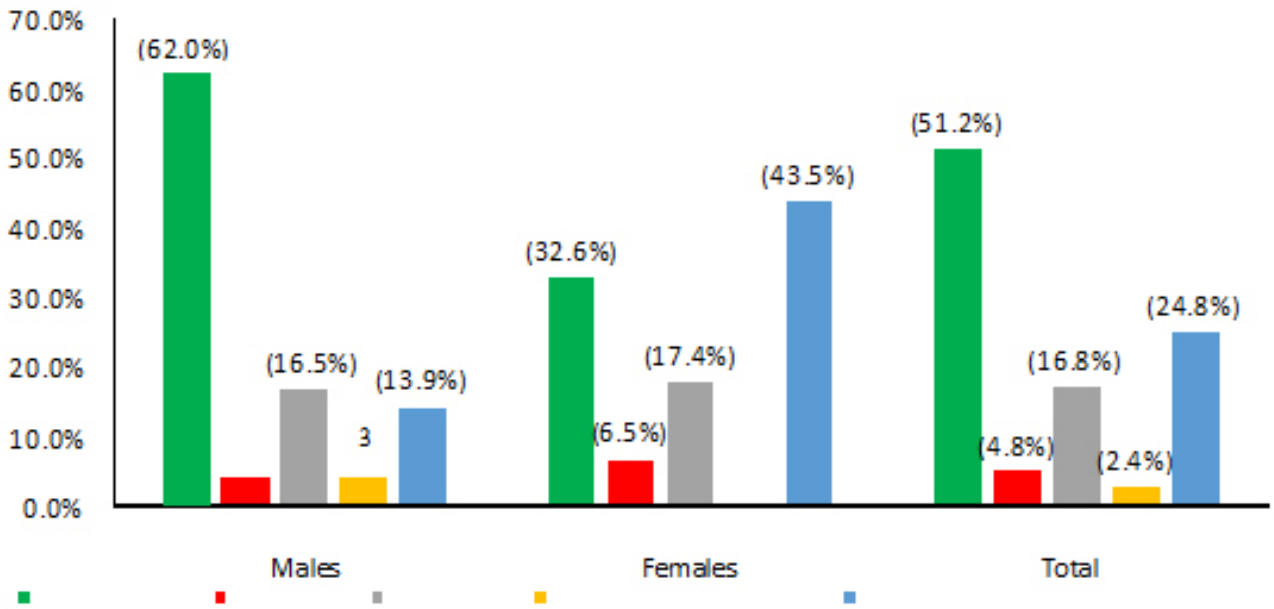
Demographic data: From 125 participants, 46 were females and 79 were males. Most participants had a degree or Master's degree/ Most participants were in private jobs and the highest percentage had a family income of Rs. 50,896 and above.

Table 1: Demographic data

	Frequency (n=125)	Percentage
Gender		
Females	46	36.8
Males	79	63.2
Education		
SSLC/ Diploma	2	1.6
PUC	5	4
Degree	50	40
Master's degree	64	51.2
Ph.D.	4	3.2
Occupation		
Business	14	11.2
Government	30	24
Housewife	9	7.2
Others	7	5.6
Private	62	49.6
Student	3	2.4
Family income		
Between INR. 2,569 and below	1	0.8
Between INR. 2,570 to 7,633	1	0.8
Between INR. 12,724 to 19,085	1	0.8
Between INR. 19,086 to 25,447	6	4.8
Between INR. 25,448 to 50, 895	24	19.2
INR. 50,896 and above	92	73.6

Identify primary health benefits of nuts:

Data represented as frequency (percentage)



Age:

The mean age of study participants was 38.6±8.1. Males were slightly older as compared to females.

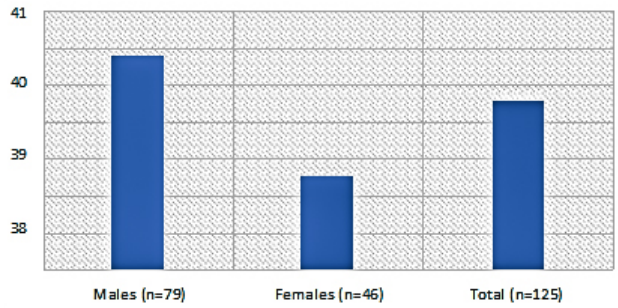


Figure 1: Gender Distribution

Aware about health benefit of nuts:

From 125 participants, 119 were aware about health benefits of nuts. There was no significant difference in percentage of males and females who were aware about health benefits of nuts ($\chi 2=3.670$, $p=0.084$).

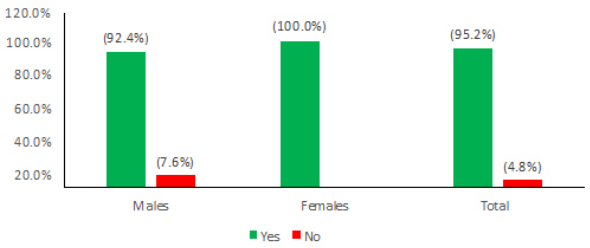


Figure 2: Awareness about health benefits of nuts

Data represented as frequency (percentage)

From 125 participants, 51.2% selected rich in proteins, 4.8% selected rich in iron, 16.8% selected rich in fibre, 2.4% selected good source of magnesium and 24.8% selected good source of omega-3 fatty acids as the primary health benefit of nuts. There was a significant association of gender and identify health benefits of nuts ($\chi2 = 17.364$, p=0.002). Higher percentage of males identified that nuts are rich in protein as compared to females whereas higher percentage of females identified that nuts are good source of omega-3 fatty acids as compared to males.

Nuts and fats:

From 125 participants, 96% reported that nuts are good source of healthy fats and 113% reported that nuts contain good fats. No significant difference was observed between males and females (p>0.05).

Table 2 : Nuts and fats

Nuts and fats:	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Nuts good source of healthy fats	75	94.9	45	97.8	120	96	0.632	0.427
Nuts contain good fats	69	87.3	44	95.7	113	90.4	2.314	0.208

Benefits of soaking nuts:

From 125 participants, most common reason identified for soaking nuts was essential nutrients being better absorbed from soaked nuts (53.6%) followed by 40% reporting that soaking removes phytic acid. Least percentage of participants identified that soaking makes nuts easy to chew (8%). Significantly higher percentage of males identified that soaked nuts are easy to digest as compared to females (p<0.05). No other significant difference was observed between males and females (p<0.05).

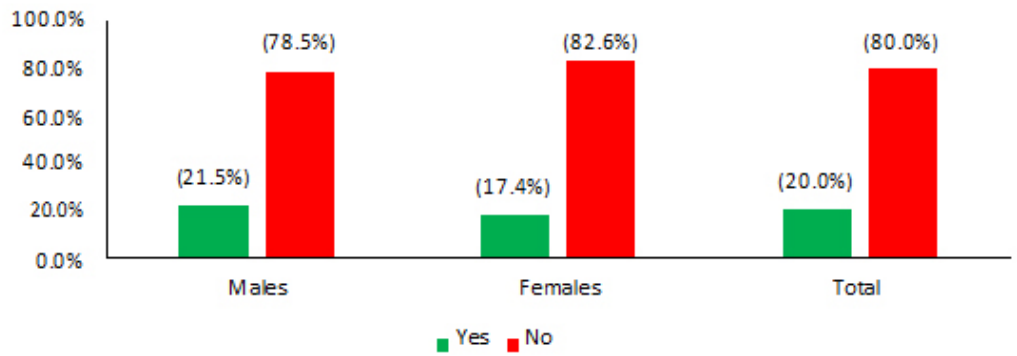
Table 3: Benefits of soaking nuts

Benefits of soaking nuts	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Easy to digest	34	43.0	10	21.7	44	35.2	5.782	0.020
Essential nutrients are better absorbed	38	48.1	29	63.0	67	53.6	2.610	0.137
Removes phytic acid which causes indigestion	31	39.2	19	41.3	50	40.0	0.052	0.851
Easy to chew	8	10.1	2	4.3	10	8.0	1.319	0.322

Nuts in moderation will make a person fat:

From 125 participants, 100 reported that nuts in moderation will not make a person fats. No significant difference in males and females ($\chi2=0.310$, p=0.578).

Figure 4: Nuts in moderation will make a person fat Data represented as frequency (percentage)



Nuts consumed: The most commonly consumed nut was almonds (96.8%) whereas the least consumed nut was Brazil nut (5.6%). A significantly higher percentage of females consumed walnuts and pistachios as compared to males ($p<0.05$). No other significant differences were observed between males and females ($p>0.05$).

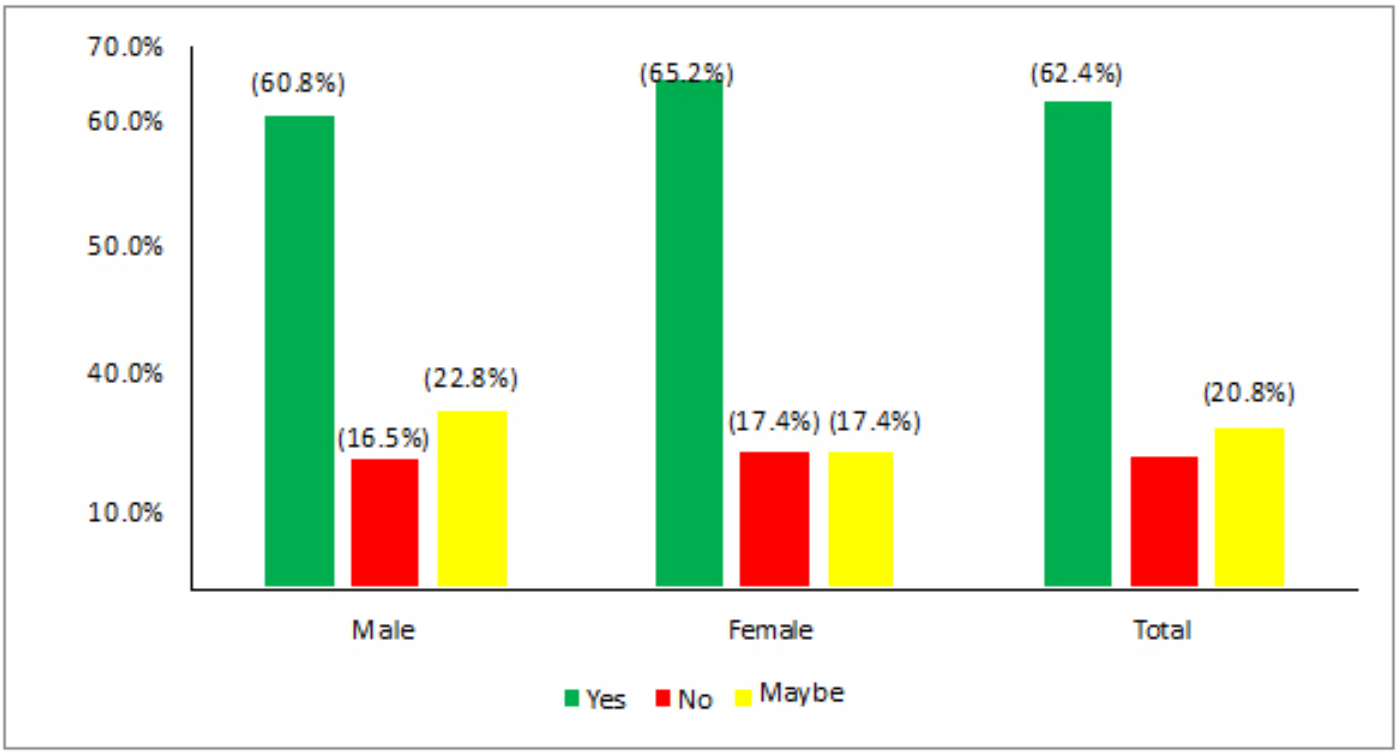
Table 4. Nuts consumed by participants

Nuts consumed by participants	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Almonds	75	94.9	46	100.0	121	96.8	2.406	0.296
Walnuts	35	44.3	33	71.7	68	54.4	8.821	0.005
Brazil nuts	3	3.8	4	8.7	7	5.6	1.319	0.421
Pistachios	31	39.2	31	67.4	62	49.6	9.216	0.003
Macadamia	2	2.5	2	4.3	4	3.2	0.310	0.625
Peanuts	58	73.4	34	73.9	92	73.6	0.004	0.999
Cashew nuts	55	69.6	38	82.6	93	74.4	2.575	0.138
Hazel nuts	8	10.1	8	17.4	16	12.8	1.375	0.274

Prefer consuming organic nuts when compared with inorganic ones:

From 125 participants, 62.4% reported they prefer consuming organic nuts as compared to inorganic ones. No significant difference was observed between males and females ($\chi2=0.514$, $p=0.773$)

Figure 14 : Prefer consuming organic nuts as compared to inorganic nuts Form



Form of consuming nuts:

The most commonly consumed form of nuts is unsalted (69.6%) whereas least commonly consumed form nut was flavored (12%) and energy bars (13.6%). Significantly higher percentage of males consumed salted nuts as compared to females ($p<0.05$). No other significant differences were observed between males and females ($p>0.05$).

Table 5: Form of consuming nuts

Form of consuming nuts	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Flavoured	11	13.9	4	8.7	15	12.0	0.753	0.569
Salted	30	38.0	8	17.4	38	30.4	5.821	0.017
Unsalted	54	68.4	33	71.7	87	69.6	0.157	0.840
Roasted	33	41.8	16	34.8	49	39.2	0.596	0.455
Ladoo/ sweets	23	29.1	17	37.0	40	32.0	0.822	0.428
Energy bar	10	12.7	7	15.2	17	13.6	0.162	0.788
Dessert	16	20.3	13	28.3	29	23.2	1.046	0.380

Time of consuming nuts:

The most common time of consuming nuts was morning (68.8%) and least common time was mid-morning (27.2%). Significantly higher percentage of males consumed nuts in evening as compared to females ($p<0.05$). On the other hand, significantly higher percentage of females consumed nuts in morning as compared to males ($p<0.05$). No significant difference was observed in percentage of males and females who consumed nuts at mid-morning ($p>0.05$).

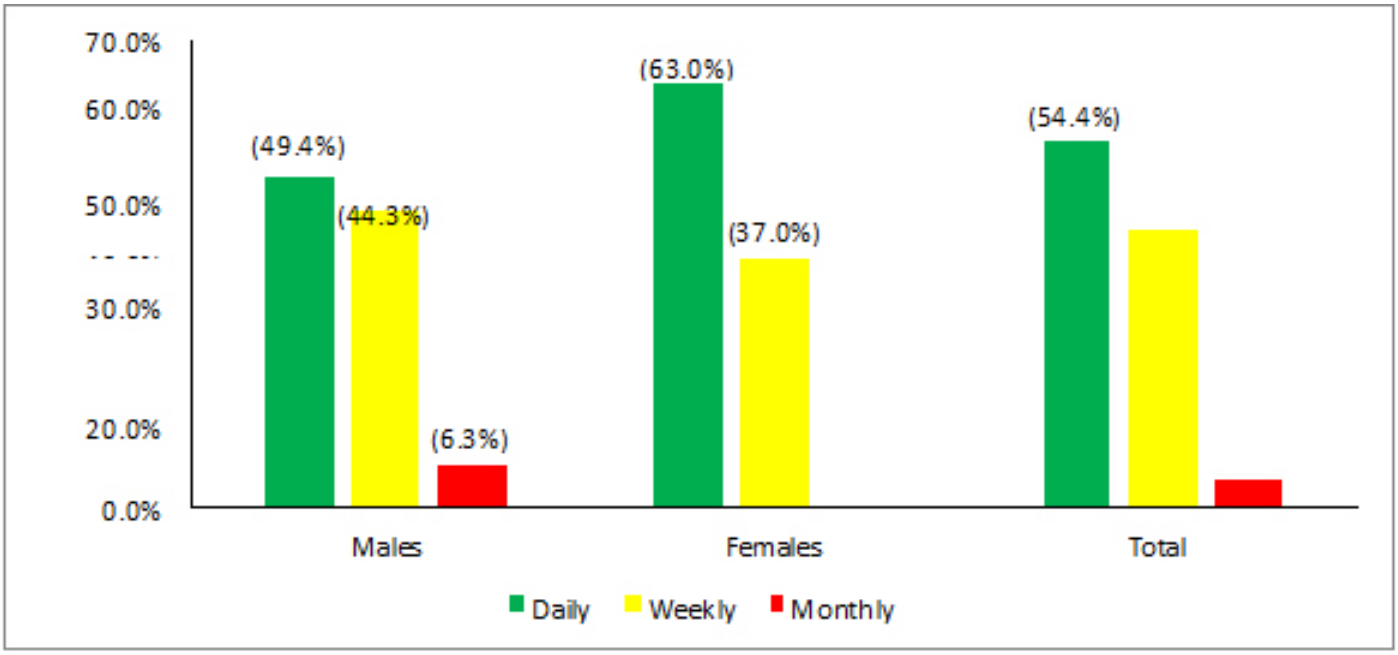
Table 6: Time of consuming nuts

Time of consuming nuts	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Morning	49	62.0	37	80.4	86	68.8	4.590	0.045
Mid-morning	20	25.3	14	30.4	34	27.2	0.385	0.540
Evening	40	50.6	11	23.9	51	40.8	8.593	0.004

Frequency of consuming nuts:

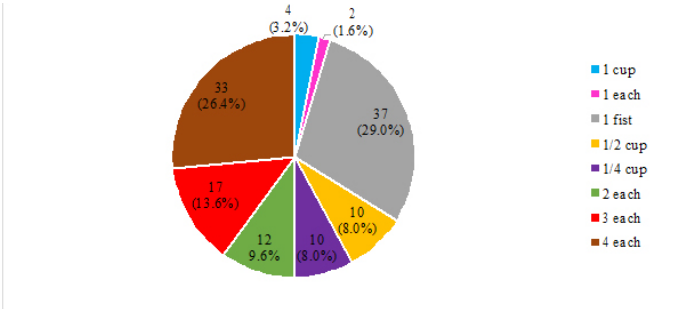
From 125 participants, 54.4% consumed nuts daily, 41.6% consumed nuts weekly, and 4% consumed nuts monthly. No significant difference was observed in the frequency of consuming nuts when classified according to gender ($\chi2=4.288$, $p=0.117$).

Figure 5: Frequency of consuming nuts Data represented as frequency (percentage)



Quantity of nuts consumed:

The highest percentage of participants consumed a fistful of nuts (29%) followed by 26.4% consumed only 4 nuts.



Duration of soaking nuts:

The highest percentage of participants consumed soaked nuts (62.4%). There was no significant difference in the time for which nuts were soaked when classified according to gender (p>0.05).

Table 7: Duration of soaking nuts

Duration of soaking nuts	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Don't soak nuts	19	24.1	13	28.3	32	25.6	3.373	0.643
1 hour	3	3.8	1	2.2	4	3.2		
2 hours	2	2.5	0	0	2	1.6		
3 hours	1	1.3	1	2.2	2	1.6		
6 hours	6	7.6	1	2.2	7	5.6		
Overnight	48	60.8	30	65.2	78	62.4		

Method of storing nuts:

The highest percentage of participants stored nuts in glass contained (52%) whereas the lowest percentage of participants stored nuts in steel containers (12.8%). No significant difference was observed in the percentage of males and females who stored nuts in various containers (p>0.05).

Table 8: Method of storing nuts

Method of storing nuts	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Glass container	46	58.2	19	41.3	65	52.0	3.336	0.094
Plastic container	22	27.8	8	17.4	30	24.0	1.743	0.202
Steel container	10	12.7	6	13.0	16	12.8	0.004	0.999
Air-tight container	23	29.1	17	37.0	40	32.0	0.822	0.428
Refrigerate	12	15.2	9	19.6	21	16.8	0.398	0.621

Place of purchasing nuts:

The most common place of purchasing nuts was pre-packaged from grocery (62.4%) whereas only 4.8% purchased it from framer's market. No significant difference was observed in the percentage of males and females who brought nuts from different places (p>0.05).

Table 9: Place of purchasing nuts

Place of purchasing nuts	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Pre-packaged from grocery stores	51	64.6	27	58.7	78	62.4	0.426	0.568
Bulk bins in grocery stores	17	21.5	5	10.9	22	17.6	2.273	0.151
Online stores	15	19.0	8	17.4	23	18.4	0.049	0.999
Specialty stores	12	15.2	7	15.2	19	15.2	---	NA
Farmer's market	5	6.3	1	2.2	6	4.8	1.098	0.413
Others	3	3.8	0	0.0	3	2.4	1.790	0.397

From 125 participants, 122 enjoyed consuming nuts and believed that consuming nuts is a healthy dietary choice. There was no significant difference observed between males and females (p>0.05)

Table 10: Enjoy nuts and is healthy dietary choice

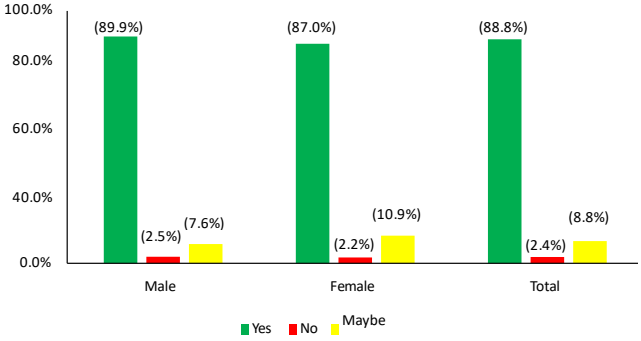
Enjoy nuts and is healthy dietary choice	Males (n=79)		Females (n=46)		Total (n=125)		χ2 value	P value
	N	%	N	%	N	%		
Enjoy consuming nuts	78	98.7	44	95.7	122	97.6	1.179	0.554
Believe consuming nuts is a healthy dietary choice	78	98.7	44	95.7	122	97.6	1.179	0.554

Tried nut-based alternative products:

Of 125 participants, only 21.6% reported that they have tried nut-based alternative products. A significantly higher percentage of males reported to have tried nut-based alternative products as compared to females (χ2=6.907, p=0.032)

Figure 7: Tried nut-based alternative products
Data represented as frequency (percentage)

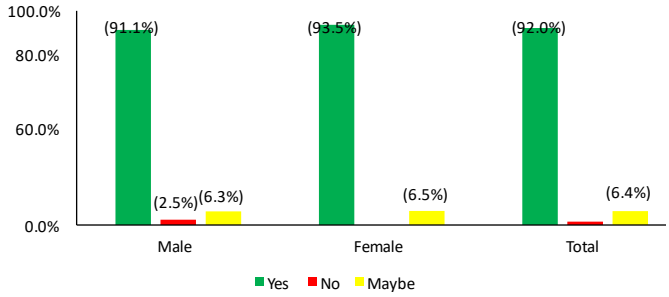
Consider nuts to be a convenient and portable snack option:



From 125 participants, 115 considered nuts to be a convenient and portable snack option. No significant difference was observed between males and females ($\chi2=1.184$, $p=0.553$).

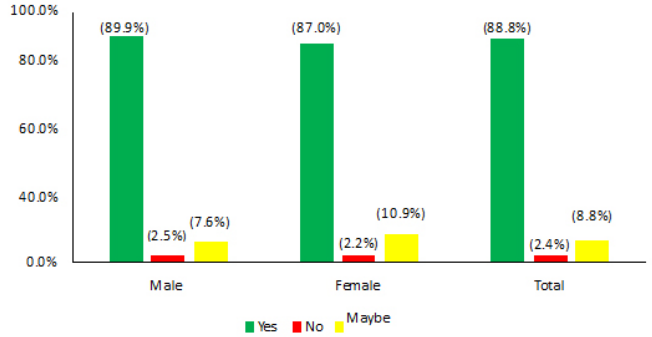
Figure 8 : Consider nuts to be a convenient and portable snack option Data represented as frequency (percentage)

Nuts can contribute to balanced diet:



From 125 participants, 111 reported that nuts can contribute to a balanced diet. No significant difference was observed between males and females ($\chi2=0.398$, $p=0.820$)

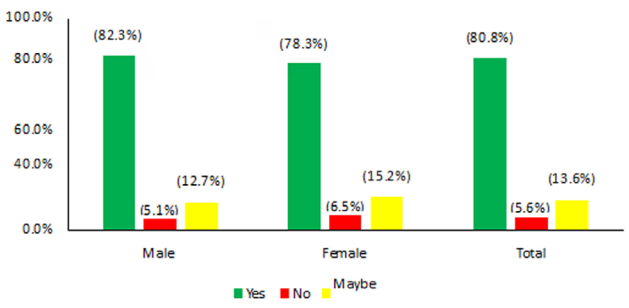
Figure 9: Nuts can contribute to a balanced diet
Data represented as frequency (percentage)



Nuts are satisfying and filling snack option:

From 125 participants, 101 reported that nuts are a satisfying snack option. No significant difference was observed between males and females ($\chi2=0.309$, $p=0.857$).

Figure 10: Nuts are a satisfying and filling snack option
Data represented as frequency (percentage)



Consuming nuts can support weight management:

From 125 participants, 72% reported that consuming nuts can support weight management. No significant difference was observed between males and females ($\chi2=4.482$, $p=0.106$)

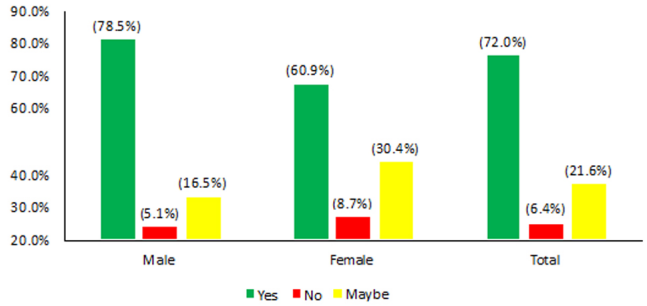
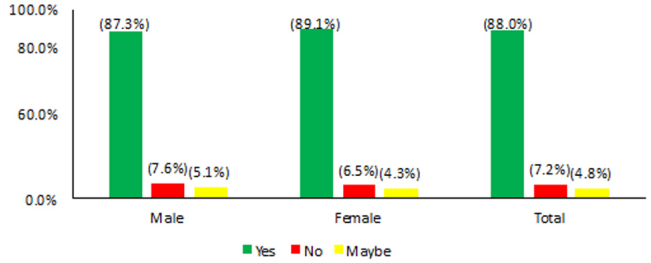


Figure 11: Consuming nuts can support weight management
Data represented as frequency (percentage)

Nuts are versatile ingredient that can be used in various recipes:

From 125 participants, 110 reported that nuts are versatile ingredients that can be used in various recipes. No significant difference was observed between males and females ($\chi=0.088$, $p=0.957$)

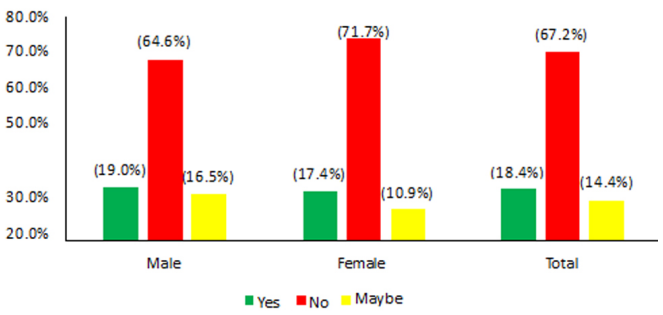
Figure 12: Nuts are versatile ingredients that can be used in various recipes Data represented as frequency (percentage)



Prefer consulting a dietitian/ doctor before consuming nuts:

From 125 participants, only 18.4% consulted a dietitian/ doctor before consuming nuts. No significant difference was observed between males and females ($\chi2=0.893$, $p=0.640$)

Figure 13: Prefer consulting a dietitian/ doctor before consuming nuts
Data represented as frequency (percentage)



Conclusion

In this comprehensive study involving 125 participants, our exploration into their knowledge, preferences, and perceptions of nuts revealed several key insights. Notably, a significant majority, comprising 62.4% of the participants, expressed a preference for consuming organic nuts over inorganic counterparts, with no discernible gender-based differences. The identification of individuals with nut allergies and those abstaining from nut consumption underscored the dietary limitations and personal choices associated with nut intake. However, it is important to note that the study did not specifically delve into the nuances of walnuts and pistachios, suggesting a potential area for future research. The findings highlighted a heightened awareness of the health benefits associated with nuts, with notable gender-related differences in recognizing specific advantages. Almonds emerged as the most consumed nut among participants, who reported diverse forms and quantities of nut incorporation into their diets. Furthermore, the study brought attention to participants' recognition of the benefits of soaking nuts and their preference for organic options, indicative of a growing interest in food quality and sustainability. As a whole, this research provides valuable insights into nut consumption patterns and attitudes, laying a foundation for future studies and interventions aimed at promoting nut consumption and maximizing associated health benefits.

Summary

Among the 125 participants in the study, a large majority of 119 participants (95.2%) were aware of the health benefits associated with nuts. This high level of awareness indicates that the majority of the participants recognized the positive impact that nuts can have on their health. Moreover, when comparing the awareness levels between males and females, there was no significant difference observed. The chi-square test results indicated that the difference in the percentage of males and females who were aware of the health benefits of nuts was not statistically significant ($\chi 2=3.670$, $p=0.084$).

When asked about the primary health benefits of nuts, the participants were given multiple options to choose from. Among the respondents, 51.2% selected "rich in proteins" as a primary health benefit of nuts, indicating that they recognized nuts as a good source of protein. This finding aligns with the general knowledge that nuts are indeed a rich source of plant-based protein, which is important for various bodily functions, including muscle growth and repair.

Furthermore, 16.8% of the participants identified "rich in fiber" as a primary health benefit, emphasizing the importance of nuts in promoting digestive health. Fiber is known for its role in supporting healthy digestion and preventing constipation. By acknowledging the fiber content in nuts, participants recognized the potential benefits for their digestive well-being.

In addition, 2.4% of the participants acknowledged the "good source of magnesium" attribute of nuts. Magnesium is an essential mineral that plays a vital role in numerous physiological processes, including nerve function, muscle health, and bone strength. This finding suggests that a small portion of the participants recognized the potential health benefits of nuts related to magnesium content.

Interestingly, only 4.8% of participants selected "rich in iron" as a primary health benefit. Iron is a crucial mineral involved in oxygen transport within the body and the production of red blood cells. The lower percentage of participants recognizing iron as a primary health benefit of nuts suggests that iron content may be less commonly known or emphasized compared to other nutritional aspects of nuts.

Finally, 24.8% of the respondents identified "good source of omega-3 fatty acids" as a primary health benefit. This finding aligns with the knowledge that nuts, particularly walnuts and certain seeds like flaxseeds, contain significant amounts of omega-3 fatty acids. Omega-3 fatty acids are known for their potential cardiovascular benefits and anti-inflammatory properties.

A notable finding from the study was the significant association between gender and the identification of health benefits of nuts. The chi-square test revealed a statistically significant relationship ($\chi 2 = 17.364$, $p=0.002$) between gender and the selection of health benefits. A higher percentage of males correctly identified nuts as being rich in protein compared to females, while a higher percentage of females recognized nuts as a good source of omega-3 fatty acids compared to males. This gender difference in knowledge and awareness regarding specific health benefits highlights the need for targeted education and communication strategies to ensure that both males and females are well-informed about the diverse nutritional benefits of nuts.

Overall, the study indicates that the majority of the participants were aware of the health benefits of nuts, with no significant gender difference in awareness levels. The primary health benefits identified by the participants included being rich in proteins, fibers, and omega-3 fatty acids. The gender differences observed in the selection of health benefits highlight varying levels of awareness and knowledge between males and females regarding the specific nutritional benefits of nuts.

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