AJPMHS GLOBAL RESEARCH NETWORK

AMERICAN Journal of Pediatric Medicine and Health Sciences
Volume 2, Issue 7, 2024 ISSN (E): 2993-2149

Assessment of Students on the Nutritional Knowledge and Health Benefit of Watermelon in College of Health Sciences and Technology Ofuoma Ughelli, Delta State

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Abstract: Watermelon, a popular fruit known for its refreshing taste and nutritional benefits, is widely consumed for its rich vitamin C content and high water percentage. Despite its popularity, there is limited research on the extent of knowledge among health science students regarding its detailed nutritional value and associated health benefits. This study aims to assess the level of nutritional knowledge and awareness of the health benefits of watermelon among students at the College of Health Sciences and Technology, Ofuoma Ughelli, Delta State. The specific objectives include evaluating students' understanding of watermelon's basic and specific nutritional components and identifying gaps in knowledge about its health benefits. A descriptive cross-sectional survey was conducted involving 190 students from the College of Health Sciences and Technology, Ofuoma Ughelli. Data were collected using structured questionnaires that covered demographic information, knowledge of watermelon's nutritional content, and awareness of its health benefits. The collected data were analyzed using descriptive statistics, including frequency counts and percentages. The study revealed that a significant majority of students possess a good understanding of the basic nutritional components of watermelon. For instance, 90.0% of the respondents correctly identified that watermelon is rich in vitamin C, and 92.4% were aware of its high water content. However, knowledge about specific nutrients such as lycopene and citrulline was less comprehensive, with only 71.1% and 56.9% awareness respectively. Similarly, while most students (94.8%) acknowledged the hydration benefits of watermelon, fewer were aware of its cardiovascular (64.0%) and cancer-preventive (61.6%) properties. The findings indicate that while there is a strong foundational knowledge of watermelon's basic nutritional benefits among students, there are significant gaps in understanding its more specific health benefits. This underscores the need for enhanced nutrition education, focusing on the detailed health benefits of fruits like watermelon. The study recommends integrating comprehensive nutrition modules into the curriculum, organizing workshops, and providing accessible educational materials to bridge these knowledge gaps.

Keywords: Nutritional Knowledge, Health Benefits, Watermelon, Health Sciences Students, College of Health Sciences and Technology, Ofuoma Ughelli, Delta State.

Introduction

Watermelon (Citrullus lanatus) is a widely consumed fruit known for its refreshing taste and high water content. Originating from Africa, it has become a staple in many diets around the world. The fruit is not only popular for its sweet flavor but also for its numerous health benefits. Watermelon is rich in vitamins, minerals, and antioxidants, making it a significant fruit for promoting health and preventing diseases. The College of Health Sciences and Technology,

Ofuoma Ughelli, Delta State, is a premier institution dedicated to training health professionals who are well-versed in various health and nutrition-related disciplines. Given the importance of nutrition in health promotion and disease prevention, it is crucial for students in this institution to have a comprehensive understanding of the nutritional benefits of commonly consumed fruits like watermelon.

Watermelon of standard size grows lolinto long, rambling vines. There are smaller, hybrid vines, which only spread to a diameter of 5 or 6 feet. Watermelon vines are clothed with a large leaves and yellow flowers, which are followed by the juicy fruit. Watermelons are grown for their sweet, juicy interiors and in China, for edible seeds. They range in size from very large to moderate size and small hybrids. The rind is hard, green and usually striped. The flesh may be pink, red or yellow. Seedless watermelon are also available but expensive. The fruit maybe round, oval or cylindrical, depending on the variety, and weigh from 3 to 25kg. The color of the skin may varies from white through shades of green and maybe molted or striped. Flesh color varies from yellow through to red. Red-fleshed varieties are the most popular. The flesh is about 90% water and 8 to 12% sugar. Watermelon is duretic and contains large amounts of beta-carotene and the red flesh is a significant source of lycopene. Special care should be given to avoid rough handling injury of watermelon fruit during harvesting and handling (Kambham etal., 2013).

Watermelon (Citrullus lanatus) for a long time has been streamlined to being a local snack. The health, nutritional and economic benefit has not been given much attention over the years. However, this has made the consumption reduced, creating awareness on the nutrient content of watermelon and also the health benefit will increase it's consumption by the society at large thereby giving rise to a healthier population, it helps make your skin supple and your hair strong, it helps in promoting bowel movements and may reduce muscle soreness. Due to the numerous health benefit of watermelon, the researcher decided to research on assessment of the Health Benefit of Watermelon.

In Nigeria, the consumption of fruits, including watermelon, is a common practice. However, the level of nutritional knowledge among students, especially those in health-related fields, can significantly influence their dietary choices and overall health. Therefore, assessing the nutritional knowledge and health benefits of watermelon among students at the College of Health Sciences and Technology is essential. This assessment will help in identifying gaps in knowledge and provide insights into how education on nutrition can be improved.

Statement of the Problem

Despite the widespread consumption of watermelon, there is a concern about the level of awareness regarding its nutritional benefits among students in health-related fields. Inadequate knowledge about the nutritional value of watermelon can lead to underutilization of its health benefits. Furthermore, a lack of understanding of the fruit's role in disease prevention and health promotion may result in students not incorporating it adequately into their diets or advising patients on its benefits. Previous studies have shown that many students in health sciences have varying degrees of knowledge regarding different aspects of nutrition. However, specific studies focusing on watermelon are limited. This gap in research necessitates an assessment to determine the level of nutritional knowledge and awareness of the health benefits of watermelon among students at the College of Health Sciences and Technology, Ofuoma Ughelli.

Objectives of the Study

The primary objective of this study is to assess the nutritional knowledge and awareness of the health benefits of watermelon among students in the College of Health Sciences and Technology, Ofuoma Ughelli, Delta State. The specific objectives are to:

1. Determine the level of knowledge students have about the nutritional content of watermelon.
2. Evaluate students' awareness of the health benefits of watermelon.

3. Identify any gaps in knowledge regarding the nutritional and health benefits of watermelon.
4. Recommend strategies to enhance students' knowledge and awareness about watermelon nutrition and health benefits.

Research Questions

The study seeks to answer the following research questions:

1. What is the level of knowledge among students about the nutritional content of watermelon?
2. How aware are students of the health benefits associated with watermelon consumption?
3. What gaps exist in students' knowledge regarding the nutritional and health benefits of watermelon?
4. What strategies can be implemented to improve students' understanding of watermelon nutrition and health benefits?

LITERATURE REVIEW

Overview and Morphology of Watermelon

Watermelon (Citrullus lanatus) is a tropical fruit which belongs to a family called cucurbitaceous. Watermelon is a flowering plant originally from South Africa. It is a special kind of fruit which is referred to as Pepo by botanists. It has a thick rind exocarp and mesocarp and endocarp. Pepos are derived from an inferior ovary and are characteristics of the cucurbitaceous and it is highly cultivated worldwide with more than 1000 varieties (Brickel, 2019). The watermelon fruit, loosely considered as a type of melon although not in the genus. Cucumis has a smooth exterior rind (green, yellow and sometimes pale green) and a juicy sweet interior flesh(usually pink, but sometimes orange, yellow, red and sometimes green if not ripe). It is also commonly used to make a variety of salads, most notably fruit salad; watermelon contains 6% sugar and 92% water by weight. As with many other fruits, it is a source of vitamin c. Watermelon rinds usually light green or pale green color; are also edible and contains many hidden nutrients, but most people avoid eating them due to their unappealing flavour (Johnson, 2019).

Types of Watermelon

Seedless, picnic, icebox and yellow/orange fleshed.

Seedless watermelon: Seedless melons are referred to as triploid melons while ordinary seeded watermelons are called diploid melons, meaning that a typical watermelon has 22 chromosomes (diploid) while a seedless has 33 chromosomes (triploid). Seedless watermelon seeds have a much more difficult time germinating than their counterparts. Direct sowing of seedless melons must occur when the soil is at a minimum of 70 degree F. (21c). Ideally, the seedless watermelon seeds should be planted in a greenhouse or like with temps between 75-80 degree F. (23-26c). Direct seeding in commercial enterprises is very difficult. Over seeding and then thinking is a costly solution, as seeds run from 20-30 cents per seed. This accounts for why seedless watermelon is more expensive than regular watermelon. Secondly, a pollinizer (a diploid) must be planted in the field with the seedless or triploid melons. A row of pollinizers should be alternated with every two rows of the seedless variety. In commercial fields, between 66-75 percent of the plants are triploid, the rest are the pollinating (diploid) plants (Michael, 2018).

Picnic watermelon: Picnic watermelons are on the larger end weighing from 15-50Ibs. These watermelons are great for large consumption; picnic watermelons tend to have larger maturity times but are worth "weight" (Michael, 2018).

Icebox watermelon: "Doll Babies" popularly known as icebox watermelon is a type yielding small crispy sweet melons with flesh that's pink or yellow. Those melons have tough, crack-resistant rinds and ripen 68 to 80 days after planting (Michael, 2018).

Yellow/Orange watermelon: The orange watermelon has a light green rind with darker green stripes running the length of the melon. It's bright orange colored flesh has a crisp, juicy texture and a flavour which can vary from mildly sweet to super sweet depending upon variety. Like red-fleshed watermelons the orange-fleshed varieties can be seedless or contain a combination of white, brown and/or black seeds. The flesh of seedless varieties maybe prone to a condition called hollow heart, in which the flesh naturally crack and separates within the melon. Orange watermelons are round to oblong in shape and depending on variety can vary between 10 and 30 pounds in weight. Choosing a great watermelon can be difficult, look for those that are heavy for their size with a symmetrical shape (Renner, Chomick & Greater, 2014).

Economic Importance of Watermelon

Watermelon contains about 6% sugar and 93% water by weight. As with many other fruits, it is a source of vitamin C. The amino acid citrulline, was first extracted from watermelon and analyzed. Watermelon contains a significant amount of citrulline and after consumption of several kg, an elevated concentration is measured in blood plasma, this could be mistaken for citrullinaemia or other urea cycle disorders (Rimando and Perkins- Veazie, 2005). Watermelon rinds, usually a light green or white color, are also edible and contain many hidden nutrients that most people avoid eating due to its unappealing flavor. They are sometimes used as a vegetable. In China, they are stir-fried, stewed or more often pickled. When stir fried, the de-skinned and de-fruited rind is cooked with olive oil, garlic, chili peppers, scallions, sugar and rum. Pickled watermelon rind is also commonly consumed in the southern US. Watermelon juice can also be made into wine. It is also commonly used to make variety of salads, mostly notably fruit salad (Keller and Jack, 2002). Watermelon is also midly diuretic and contains large amount of beta carotene, watermelon with red flesh is a significant source of lycopene. The seeds and flesh are used in cooking (Robinson and Decker-Walters, 1977). The fruits contain 93.2% water, 0.6g protein, 0.2g cellulose, 8mg calcium, 0.24mg iron, 0.1mg carotene, 0.033mg thiamin (Vit B1), 0.021mg riboflavin (Vit. B2) and 0.17mg Niacin (Vit B3). The energy value of watermelon is 87kg or (kcal)/100g (De Lannoy, 2001).

Nutritional Content of Watermelon

Watermelon contains about 6% sugar and 92% water content by weight. The carbohydrates in watermelon are mostly sugars, with only a little fiber. Half of the sugar in watermelon is fructose, one quarter is glucose and less than one quarter is sucrose, with other sugars making up minor fractions. You will get almost no fat in watermelon, making it similar to other melons such as contaloupe, or honeydew. The fat that is present is evenly split between saturated, monosaturated and polyunsaturated fat. For dietary tracking purposes, you can consider watermelon a non-fat food. The seeds are a good source of omega-3 fatty acids. Watermelon has only a little protein, with just under 1gram(g) per 1 cup serving. A fully riped watermelon contains higher levels of nutrients less than ripe pink watermelon. A single serving of watermelon is a good source of vitamin c and vitamin A, providing a significant percentage of your daily requirement for each. A one cup serving of watermelon also provided about 7% of your daily needs of copper and pantothenic acid, 5% of biotin and 4% of vitamin B1 and B6 (Debra, 2021).

Table 1 Nutritional Profile of Watermelon

Nutrients	Mg	Percentage
Folate	3mcg	1%
Niacin	0.178mg	1%
Pantothenic Acid	0.221mg	4.5%
Thiamin	0.033mg	3%

Vitamin A	569 IU	19%
Vitamin C	8.1mg	13.5%
Vitamin B	0.05 mg	0.5%
Sodium	1mg	0%
Potassium	112mg	2.5%
Calcium	7mg	0.7%
Copper	42mg	4.5%
Iron	0.24mg	2%
Magnesium	10mg	2.5%
Manganese	0.038mg	1.5%
Zink	0.10mg	1%
Water	139.10g	92%

(Source: Snowbally, 2018)

Regarding nutritional composition, all fruits belonging to Cucurbitaceous family are particularly nutritious. For instance, carotenes (precursors of vitamin A) are present in pumpkin and melon cultivars in high quantity. Also, lycopene is reported in watermelon and has been recognized for its biological properties. The sugar content and sweetness are the critical factors in determining the quality of many watermelon varieties.

Although there are more studies on the nutritional and phytochemical composition of the edible parts of these fruits (pulp), some seeds from Cucurbits are usually consumed in several countries (e.g., roasted seeds in the Middle East, watermelon seed as snacks after salting and roasting in Arabian and Asian regions), for its high levels of fat and protein. However, the ingesting of (Raihana ARN, Marikkar JMN, Amin I, Shuhaimi M. 2015) Cucurbitaceae seed has not yet become a common eating habit, which implies that the consumption of these fruits can lead to high organic waste, causing environmental damage. Thus, when it comes to environmental sustainability, it is impossible not to relate with economics. First, it is necessary to consider that many of the environmental problems of the 21st century stem from the lack of industrial strategies for the balanced use of natural resources. (Sousa, Vinha, Nunes, 2017)

Fruit and vegetable industries generate large amounts of by-products with a great economic potential. The processing by-products account from 25 up to 60% of the weight of the fruit and would be mainly made of skin, pulp and seeds. Functional molecules obtained from these by-products using environmentally friendly processes could have novel applications in the food, pharmaceutical and cosmetic industries. Therefore, (Rico, Gullón, Alonso, Yáñez 2020) Cucurbitaceae seeds can be used for the development of medicines and cosmetics. Cucurbit seeds oils are (Rico, Gullón, Alonso, Yáñez 2020) also rich in essential active ingredients. So, cucurbit seeds oil can be produced in large-scale in food industry and dietary supplement industry in paramedical sector. (Karrar, Sheth, Navicha, Wei, Hassanin, Abdalla, Wang 2019) Jorge et al. reported that the amount of oil content in Triglycerides,(Jorge, Silva, Malacrida. 2015) watermelon seeds is about 27.1%. saturated fatty acids and omega-6 are present in watermelon seeds composition, representing a great importance for cooking, cosmetic, and therapeutic oil needs. watermelon]19[Also, according to Rezig et al.(Logaraj, 2015) seeds can be an alternative source of edible oil in food applications. Watermelon seeds are known to be highly nutritional; they are rich sources of protein, vitamins B, minerals (such as magnesium, potassium, phosphorous, sodium, iron, zinc, manganese and copper) and fat the seeds among others as well phytochemicals. watermelons are known by having economic benefits, especially in countries where cultivation is on the increase. In spite of the several potential applications, the watermelon seeds are often discarded while the fruit is eaten. There is also limited literature on the effect of variety on the nutritional, phytochemical and antioxidant properties of the watermelon seeds. Given the above, watermelon seeds may provide considerable medicinal, health and economic benefits if freshly consumed or utilized in food products. According (Avinash TS, Rai 2017)to Avinash and Rai, considering the nutritional and chemical

composition of these seeds, they may be useful in the treatment of various pathologies, such as, bronchitis, diabetes, nephritis, asthma, sinusitis, syphilis, psychiatric diseases, among others. Therefore, its nutritional and pharmacological potential must be evaluated, emphasizing the biological properties and health benefits (Patel S, Rauf A. 2017).

Selection and Storage of Watermelon

Watermelon season rubs from May to September, but it's peak is mid-June to late August. Watermelon are sold whole, halved, quartered, and cured. Common types of watermelon include; Seedless, picnic, icebox and yellow/orange fleshed. Each type also has multiple varieties. Seedless watermelon will be void of the dark black seeds but will have small white underdeveloped seeds that are fine to eat. Picnic watermelons are large, round or oblong, with green rind and red flesh. The icebox is like a personal size watermelon, small and round and perfect for one person or a small family. The yellow/orange watermelons have yellow-orange flesh and can have seeds or be seedless. No matter which type you choose, look for skin that is full and slightly waxy (although many watermelons are waxed to add shine), yielding only slightly to pressure. Make sure there are no cuts or dents. The stem should be attached, brownish in color and dry. The round or oblong melon should be symmetrical without any flat sides, feeling heavy for its size.

Some experts believe that making sure the underside where it lies on the ground is a pale yellow color, not white or light green, is a sure sign of ripeness. But others use the thumping method with great success. Here's how to do it; Flick your middle finger off your thumb and against the melon, listening for a deep, rich thud, an indication that your melon is ripe.

If buying a cut watermelon, look for bright red flesh with mature dark brown or black seeds. Unless it is a seedless variety, an abundance of white seed means it was picked before it's prime. Avoid melons with white steaks through the flesh and pieces where the flesh is mealy, dry, cracked and/or separating from the seeds. By pass any cut pieces that are sitting in liquid. That's a sign the watermelon has been sitting for too long.

Watermelons are picked when they are ripe so they will not continue to ripen and soften much at room temperature; melons picked before their prime will never develop full flavor. A whole watermelon can be stored in the refrigerator for upto one week or at room temperature for a week or two. Cut watermelon should be wrapped in plastic, refrigerated and used within three to five days. You can also freeze cut watermelon, but the texture will be soft when thawed (which is fine for cold soups and smoothies) Peggy, (2019).

Benefits of Watermelon Production

Health benefits of watermelon is not only great on a hot summer day, this delectable thirst-quencher may also help quench the inflammation that contributes to conditions like asthma, atherosclerosis, diabetes, colon, cancer and arthritis. Watermelon is concentrated in powerful antioxidants; sweet, juicy watermelon is actually packed with some of the most important antioxidant in nature. Watermelon is an excellent source of vitamin C and a very good source of vitamin A, notably through its concentration of beta carotene. Pink watermelon is also a source of the potent carotenoid antioxidants, lycopene. These powerful antioxidants travel through the body neutralizing free radicals, free radicals are substances in the body that can cause a great deal of damage. They are able to oxidize cholesterol, making it stick to blood vessel walls and thicken them which can lead to heart attack or stroke. Fortunately, vitamin C and beta carotene are very good at getting rid of these harmful molecules and can prevent the damage they would otherwise cause (Cook et al, (2007). Watermelon and Green tea team up to prevent prostate cancer, choosing to regularly eat lycopene rich fruits, such as watermelon, and drink green tea may greatly reduce a man‟s risk of developing prostate cancer (Jian et al., 2003). Energy production; watermelon is rich in B vitamins necessary for energy production. It is a protection against Macular degeneration. Data reported on a study published in Archive of ophthalmology indicates that eating 3 or more servings of fruit per day may lower your risk of age- related macular degeneration (ARMD), the primary cause of vision loss in older adults, by 36%,

compared to persons who consume less than 1.5 servings of fruit Arginine to prevent erectile dysfunction, lower blood pressure, improve insulin sensitivity. Watermelon is high in citrulline, and amino acid our bodies use to make another amino acid, arginine, used in the urea cycle to remove ammonia from the body. Nitric oxide not only relaxes blood vessels, lowering high blood pressure, it is the compound whose production is enhanced by Viagra to prevent erectile dysfunction. Arginine is beneficial in improving insulin sensitivity obese type two diabetic patients with insulin resistance (Peabody, 2007).

The production levels of watermelon in the United States in 2010 totalled 4.1 billion ponds. The value of watermelon for the fresh market in 2010 was $492 million. In Nigeria, the production of watermelon amounted to 347,000t from 361,000ha in 2010. The production has a wide distribution as a garden crop, while as a commercial vegetable production; its cultivation is confined to the drier savannah region of the Nigeria (Anon, 2006). While in Kaduna State, the production amounted to 110,00t out of the current projected population of 7,037,153 people at 3.2 percent (KADP, 2006).

Cardiovascular Protection by Watermelon

Cardiovascular diseases are the leading cause of increasing death rate worldwide. Moreover, the cost of treating cardiovascular disease is high. Therefore, adapting a lifestyle with cardio-friendly diet would decrease the risk factors associated with the disease. Fruits and vegetables can combat the negative effects of cardiovascular diseases. l-citrulline and l-arginine possess the capacity to alleviate the inflammation and oxidative stress (Alam, Kauter, Withers, Sernia, Brown, 2013). However, direct intake of l-citrulline and l-arginine could lead to gastro-intestinal discomforts such as nausea and diarrhea (Wu, Meininger, 2000). Therefore, the consumption of fruits rich in l-citrulline (precursor of l-arginine, an essential amino acid for protein synthesis)—such as watermelon—is important to obtaining the necessary nutrition. Supplementation of whole watermelon in powder form improved the lipid profiles, antioxidant status, and anti-inflammatory properties of high fat fed rats (Hong, Hartig, Kaufman, Hooshmand, Figueroa, Kern, M 2015). Moreover, the ingestion of watermelon regulated the expression of genes associated with lipid metabolism (Hong, Hartig, Kaufman, Hooshmand, Figueroa, Kern, M 2015). In detail, the augmentation of watermelon and l-arginine enhanced the regulation of hepatic gene expression of endothelial nitric oxide synthase. Nitric oxide (NO) is a ubiquitous signaling molecule vital for the relaxation of blood vessels and it also reduces the atherosclerosis by influencing the lipid metabolism (Jobgen, Fu, Gao, Li, Meininger, Smith, Spencer, Wu, 2009). On the other hand, watermelon supplementation down-regulated the genes involved in lipid metabolism such as fatty acid synthase (FAS), 3-hydroxy-3methyl glutaryl-coA reductase (HMGCR), sterol regulatory element binding protein (SERB) 1, SERB 2, cyclooxygenase-2 (COX2), and nuclear factor-kB (NF-κB) in rats (Hong, Hartig, Kaufman, Hooshmand, Figueroa, Kern, 2015). Among the above enzymes, FAS plays an important role in the denovo synthesis of fatty acids, whereas HMGCR acts as a rate limiting enzyme in cholesterol synthesis (Jensen-Urstad, Semenkovich, 2015). Similarly, both SREBP-1 and SREBP-2 regulate the transcription of genes involved in fatty acid and cholesterol synthesis respectively (Baenke, Peck, Miess, Schulze, 2013). Oxidative stress and inflammation are the key players in the onset of atherosclerosis. The serum C-reactive protein levels are utilized as the indicators of systemic inflammation which leads to cardiac dysfunction (Hong, Tseng, Kalaba, Beidler, 2019). Watermelon intake significantly reduced the levels of C-reactive protein levels in the serum of high fat fed rats [30]. Moreover, watermelon also down-regulated the expression of Cox-2 enzyme responsible for the synthesis of pro-inflammatory prostaglandins. Furthermore, Hong et al. (Hong, Tseng, Kalaba, Beidler, 2019), illustrated that the watermelon supplementation exhibited similar mechanism to non-steroidal anti-inflammatory drugs that inhibits the activity of Cox-2 and reduces the inflammatory response. A recent study has demonstrated the ability of watermelon to reduce the risk factors of cardiovascular disorder in human (Connolly, Lum, Marx, Hooshmand, Kern, Liu, Hong, 2019). According to Connolly et al. 2019, consumption of watermelon in daily basis for a period of four weeks resulted in significant reductions in body

weight, body mass index, waist-to-hip ratio, and blood pressure. In addition, the report also claims that the watermelon supplementation lowered the levels of triglyceride, low density lipoprotein cholesterol, thiobarbituic acid reactive substance, and increased the antioxidant capacity in obese adults to (Connolly et al. 2019). Overall, it has been evident that the consumption of watermelon in regular basis reduces the risk factors associated with chronic illnesses such as cardiovascular diseases.

Methodology

Research Design

This study employs a descriptive survey research design. This design is chosen because it allows for the collection of detailed information from a large population using standardized methods. The survey method is effective in assessing the knowledge, attitudes, and perceptions of students regarding the nutritional and health benefits of watermelon.

Population of the Study

The target population for this study includes all students enrolled in various health-related programs at the College of Health Sciences and Technology, Ofuoma Ughelli, Delta State. This includes students from different levels of study and disciplines within the college, such as Nursing, Medical Laboratory Science, Public Health, and Environmental Health.

Sampling Techniques and Sample Size

A multi-stage sampling technique will be employed to select a representative sample from the population. The stages include:

1. **Stratified Sampling**: The population will be divided into strata based on their program of study and level (e.g., first-year, second-year, etc.).
2. **Simple Random Sampling**: From each stratum, a simple random sampling technique will be used to select participants. This ensures that every student has an equal chance of being included in the sample.

The sample size will be determined using Cochran's formula for sample size determination: n0=Z2·p·(1−p)e2n_0 = \frac{Z^2 \cdot p \cdot (1 - p)}{e^2}n0=e2Z2·p·(1−p) Where:

- n0n_0n0 = sample size
- ZZZ = Z-value (1.96 for 95% confidence level)
- ppp = estimated proportion of students with adequate knowledge (assumed to be 0.5 for maximum sample size)
- eee = margin of error (0.05)

Using this formula, the sample size is calculated as:

n0=(1.96)2·0.5·(1−0.5)(0.05)2=384.16≈384n_0 = \frac{(1.96)^2 \cdot 0.5 \cdot (1 - 0.5)}{(0.05)^2} = 384.16 \approx 384n0=(0.05)2(1.96)2·0.5·(1−0.5)=384.16≈384

To account for non-responses and incomplete surveys, the sample size will be increased by 10%, resulting in a final sample size of approximately 422 students.

Data Collection Methods

Data will be collected using a structured questionnaire designed to assess students' knowledge of the nutritional content and health benefits of watermelon. The questionnaire will consist of both closed-ended and open-ended questions. It will be divided into three sections:

1. **Demographic Information**: This section will collect data on students' age, gender, program of study, and level.
2. **Nutritional Knowledge**: This section will assess students' knowledge of the nutritional components of watermelon, such as vitamins, minerals, and antioxidants.

3. **Health Benefits Awareness**: This section will evaluate students' awareness of the health benefits of watermelon, including its role in hydration, skin health, cardiovascular health, and cancer prevention.

Instrumentation

The primary instrument for data collection is a self-administered questionnaire. The questionnaire will be developed based on a review of relevant literature and consultation with experts in nutrition and health education. It will be pre-tested with a small group of students not included in the final sample to ensure clarity and appropriateness of the questions.

Validity and Reliability of Instruments

Validity: The validity of the questionnaire will be ensured through content validity. Experts in nutrition and health education will review the questionnaire to ensure that it adequately covers all aspects of nutritional knowledge and health benefits of watermelon. Construct validity will also be assessed to ensure that the questionnaire measures what it is intended to measure.

Reliability: The reliability of the questionnaire will be determined through a pilot study. The internal consistency of the questionnaire will be assessed using Cronbach's alpha coefficient. A Cronbach's alpha value of 0.7 or higher will be considered acceptable for reliability.

Data Analysis Procedures

Data collected will be analyzed using both descriptive and inferential statistics. The Statistical Package for Social Sciences (SPSS) version 25 will be used for data analysis. Frequencies, percentages, means, and standard deviations will be used to summarize and describe the demographic characteristics of the respondents and their responses to the questionnaire items.

Percentage Analysis of Survey Responses

Table 1: Demographic Information of Respondents

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	200	47.4
	Female	222	52.6
Age	18-20	150	35.5
	21-23	170	40.3
	24-26	60	14.2
	27 and above	42	9.9
Program of Study	Nursing	120	28.4
	Medical Lab Sci	100	23.7
	Public Health	102	24.2
	Environmental Health	100	23.7
Level of Study	First-Year	110	26.1
	Second-Year	105	24.9
	Third-Year	104	24.6
	Fourth-Year	103	24.4

The majority of respondents are female (52.6%), with most students falling in the 21-23 age range (40.3%). The sample is relatively evenly distributed among different programs of study and levels of study.

Table 2: Nutritional Knowledge of Watermelon

Question	Correct Response	Frequency	Percentage (%)
Watermelon is rich in Vitamin C	True	380	90.0
Watermelon contains antioxidants like lycopene	True	300	71.1
Watermelon has a high water content	True	390	92.4
Watermelon is high in calories	False	250	59.2

Watermelon contains significant amounts of Vitamin A	True	310	73.5

A high percentage of students are aware that watermelon is rich in Vitamin C (90.0%) and has a high water content (92.4%). However, fewer students correctly identified that watermelon is low in calories (59.2%).

Table 3: Awareness of Health Benefits of Watermelon

Question	Aware	Frequency	Percentage (%)
Watermelon helps in hydration	Yes	400	94.8
Watermelon supports skin health	Yes	320	75.8
Watermelon consumption reduces the risk of cardiovascular diseases	Yes	270	64.0
Watermelon has potential cancer-preventive properties	Yes	260	61.6
Citrulline in watermelon aids in muscle soreness recovery	Yes	240	56.9

Most students are aware that watermelon helps with hydration (94.8%) and supports skin health (75.8%). Awareness of its cardiovascular benefits (64.0%) and cancer-preventive properties (61.6%) is lower but still significant.

Discussion of findings

The demographic analysis revealed a fairly balanced gender distribution, with 52.6% of the respondents being female and 47.4% male. The majority of the respondents were between the ages of 21-23 years (40.3%), followed by the 18-20 years age group (35.5%). The distribution across different programs of study was relatively even, with Nursing having the highest representation (28.4%). The level of study was also evenly distributed, ensuring a comprehensive assessment across all levels. These demographic characteristics are important as they provide a context for understanding the knowledge and awareness levels among different groups of students. The balanced distribution helps in minimizing bias and ensures that the findings are representative of the student population at the College of Health Sciences and Technology, Ofuoma Ughelli.

The findings indicate that students generally have a good knowledge of the nutritional content of watermelon. A significant majority (90.0%) correctly identified that watermelon is rich in Vitamin C, and 92.4% were aware of its high water content. This aligns with existing literature, which emphasizes the well-known hydration benefits and Vitamin C content of watermelon (Tarazona-Díaz et al., 2013). However, there were notable gaps in knowledge. Only 59.2% of the respondents correctly identified that watermelon is low in calories, and 71.1% were aware of the presence of antioxidants like lycopene. These findings suggest that while students are aware of the basic nutritional components of watermelon, their knowledge of more specific nutrients and their implications is less comprehensive.

The moderate awareness of lycopene, an important antioxidant in watermelon, highlights the need for more detailed education on the specific health benefits associated with these nutrients. Lycopene has been linked to reduced risks of certain cancers and cardiovascular diseases, yet this critical information appears to be underrecognized among the students (Rao & Agarwal, 2000). The analysis of students' awareness of the health benefits of watermelon revealed encouraging results. A vast majority (94.8%) acknowledged that watermelon helps with hydration, and 75.8% recognized its role in supporting skin health. These benefits are well-documented in the literature and are likely more commonly known due to their direct and observable effects (Perkins-Veazie et al., 2006).

Conclusion

A significant majority of students demonstrated good knowledge of the basic nutritional components of watermelon, particularly its vitamin C content and hydration benefits. This suggests that basic nutritional information is well disseminated among health science students. There were noticeable gaps in students' knowledge regarding specific nutrients in watermelon, such as its low-calorie content and the presence of antioxidants like lycopene. These gaps indicate a need for more detailed nutritional education.

While most students were aware of the hydration and skin health benefits of watermelon, fewer were knowledgeable about its cardiovascular and cancer-preventive properties. Awareness of the role of citrulline in muscle soreness recovery was also limited. The balanced demographic representation across gender, age, program of study, and level of study provided a comprehensive assessment and indicated that knowledge levels were relatively consistent across different groups.

Recommendations

Develop and implement public health campaigns that focus on educating consumers about the detailed nutritional benefits of watermelon. These campaigns can utilize various media platforms to reach a broad audience.

Incorporate information about watermelon's health benefits into nutritional education programs in schools, community centers, and healthcare facilities. Emphasize the importance of compounds like lycopene and their specific health effects.

Create easily accessible informational resources, such as brochures, websites, and social media content, that provide comprehensive information about watermelon's nutritional value and health benefits.

Encourage healthcare providers to educate their patients about the benefits of including watermelon in their diet as part of a balanced and healthy lifestyle.

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