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A STUDY ON ATTITUDES AND PERCEPTIONS ON THE NUTRITIONAL VALUE AND HEALTH BENEFITS OF RAW BITTER GOURD AND BITTER GOURD RELATED PRODUCTS IN THE MARKET ON GENERAL PUBLIC IN COLOMBO DISTRICT, SRI LANKA

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ABSTRACT

This study examines the attitudes and perceptions of the general public in the Colombo District, Sri Lanka, regarding the nutritional value and health benefits of raw bitter gourd and bitter gourd-related products. Despite the potential health benefits, there is a lack of research on bitter gourd preferences and products. The findings reveal that taste preference is the primary reason for non-consumption, with 49% of respondents expressing dislike for the taste. Additionally, 25% of respondents reported a general dislike for the vegetable. However, respondents displayed a level of awareness regarding bitter gourd's health benefits, including blood sugar control, cholesterol reduction, weight loss, and immune system support. Although some respondents were familiar with bitter gourd products such as crackers, biscuits, chips, and juice, there was uncertainty about their availability. Future research should focus on education initiatives to increase awareness, innovative product development to cater to diverse tastes, exploration of culinary applications, clinical studies to further understand the health benefits, analysis of consumer preferences and market dynamics, promotion of sustainable cultivation practices, and long-term health impact assessment. These findings provide valuable insights for future research, policy formulation, and marketing strategies to promote bitter gourd consumption and leverage its nutritional value and health benefits in Sri Lanka. By addressing taste concerns, enhancing awareness, and diversifying product offerings, bitter gourd could be more widely embraced as a nutritious vegetable with potential health advantages in the Colombo District and beyond.

INTRODUCTION

Background

Bitter gourd is a tropical and subtropical vine of the family Cucurbitaceous, generally developed in Asia, Africa, and the Caribbean for its palatable organic product. Its numerous variations vary significantly in the shape and sharpness of the organic product. Momordica charantia L. Cucurbitaceous is regularly known as bitter gourd, severe gourd or amber pear. It is an individual from the cucurbit family generally developed in tropical and subtropical nations. Bitter gourd is isolated into two gatherings, which are natural products with a measurement under 5cm known as var. Minima and natural products with a measurement more than 5cm in breath known as var. Maxima. The taste of bitter gourd is bitter due to the presence of phosphorus and momordicines which is the bitterest compound. The bitter gourd will be a bit pear formed, with light green skin and a couple of dashes of yellow and the bitterness increases with maturity. (Albert, 2019)

Bitter gourd contains a train of important nutrients such as iron, magnesium, potassium and vitamin C. An incredible source of dietary fiber, it additionally contains double the calcium of spinach, beta-carotene of broccoli, and the potassium of a banana. Momordicines are the practical segments of bitter gourd. Momordicines were found at organic product in leaves, and roots. Further segments of charantin are accounted for to be exceptionally powerful to control the blood glucose in connection to insulin obstruction. Furthermore, there is an examination on the improvement of the usefulness, for example, stoutness, gourd, colon disease avoidance. Despite present day medicinal science and the improvement of diabetes, hypertension, coronary illness, and the event of malignant growth increments consistently. Bitter gourd has been known for its hypoglycemic impacts. The metabolic concentrate of Momordica charantia natural product has capacity to build mending of gastric ulcer. Leafy foods, seeds of bitter gourd are generally utilized as restorative herbs as, against HIV, hostile to ulcer, militating, against leukemic, antimicrobial, against diabetic, and hostile to tumor. (Goo, 2016)

Unripe products of severe bitter gourd have been found to have glucose bringing down limit, like that of insulin and can be utilized to treat patients with diabetes. Since 2000, severe gourd is perceived as a solid vegetable. Bitter gourd ends up as one of the imperative products. There are, issues identified with the creation of bitter gourd. Numerous ranchers are encountering numerous challenges development innovation to supply load of stable bitter gourd yearly. There are potential assorted variety of M. Charantia in which it is possible to investigate the decent variety dimension of assorted variety of charantin and nutrient C substance. (Goo, 2016)

It also has a variety of benefits such as maintaining blood sugar levels, lowering bad cholesterol level, for glowing skin and lustrous hair, helps in weight loss and boosts the immune system. (Walia, 2018). The plant usually grown in the tropics from marsh regions to elevations of up to 1,000 m. Severe gourd requires a smaller than usual temperature of 180C.It is progressively tolerant to low temperatures contrasted with different gourds, however cool temperatures will obstruct development and ice will kill the plant. The plant is adjusted to a wide assortment of precipitation conditions. (Chang, 2003)

Nutritional Value in Bitter Gourd

The numerous health, skin and hair benefits of bitter melon can be attributed to its nutritional value. It has a wide array of vitamins and minerals such as Vitamin A, Vitamin B1, Vitamin B2, Vitamin C, calcium, potassium, zinc, iron, copper and phosphorus. The chart given below shows the nutritional value of bitter gourd. (Saba, 2018)

See the table below for in depth analysis of nutrients: value per 100 g		
Principle	**Nutrient Value**	**Percentage of RDA**
Energy	17 Kcal	<1%
Carbohydrates	3.70 g	3%
Protein	1.00 g	2%
Total Fat	0.17 g	0.5%
Cholesterol	0 mg	0%
Dietary Fiber	2.80 g	7%
Vitamins		
Folates	72 µg	18%
Niacin	0.400 mg	2.5%
Pantothenic acid	0.212 mg	4%
Pyridoxine	0.043 mg	3%
Riboflavin	0.040 mg	3%
Thiamin	0.040 mg	3.5%
Vitamin A	471 IU	16%
Vitamin C	84 mg	140%
Electrolytes		
Sodium	5 mg	<1%
Potassium	296 mg	6%
Minerals		
Calcium	19 mg	2%
Copper	0.034 mg	4%
Iron	0.43 mg	5%
Magnesium	17 mg	4%

Manganese	0.089 mg	4%
Zinc	0.80 mg	7%
Phyto-nutrients		
Carotene-ß	190 µg	—
Carotene-α	185 µg	
Lutein-zeaxanthin	170 µg	—

Table 1: Analysis of nutrients: Nutritive value per 100 g

• Calories: Bitter gourd is quite low in calories with a 100-gram serving providing just 17 calories. (Saba, 2018)

• Vitamin C: Bitter gourd is an excellent source of vitamin C with 100 grams of raw pods providing 84 mg of this vitamin, which is equivalent to 140% of Recommended Daily Intake (RDI). (Saba, 2018)

• Folates: Fresh pods are a good source of folate. 100 grams of fresh pods provide 72 µg of folate which is equivalent to 18% of RDI. (Saba, 2018)

• B-vitamins: It is also a good source of B-vitamins like niacin or Vitamin B3, pantothenic acid or Vitamin B5 and pyridoxine or Vitamin B6. (Saba, 2018)

Health benefits of Bitter Melon

• Bitter melon is very low in calories, carrying just 17 calories per 100 g. Nevertheless, its pods are rich sources of phytonutrients like dietary fiber, minerals, vitamins, and antioxidants. (Rudrappa, 2018)

• Bitter melon notably contains phytonutrient, polypeptide P, and a plant insulin known to lower blood sugar levels. Also, it composes hypoglycemic agent called Charantin. Charantin increases glucose uptake and glycogen synthesis inside the cells of the liver, muscle, and fatty (adipose) tissue. Together, these compounds may have been thought to be responsible for blood sugar levels reduction in the treatment of type-2 diabetes. (Rudrappa, 2018)

• Fresh pods are an excellent source of folates, carrying about 72 µg/100g (18% of RDA). Vitamin folate, when taken by mothers during their early pregnancy time, would help reduce the incidence of neural tube defects in the newborn babies. (Rudrappa, 2018)

• Fresh bitter melon is an excellent source of vitamin-C (100 grams of fresh pod provides 84 mg or about 140% of RDI). Vitamin-C is one of the powerful natural antioxidants which helps scavenge harmful free radicals from the human body. (Rudrappa, 2018)

• Further, it is an excellent source of health benefiting flavonoids such as β-carotene, α- carotene, lutein, and zea-xanthin. It also contains a good amount of vitamin-A. Together, these compounds help act as protective scavengers against oxygen-derived free radicals and reactive oxygen species (ROS) that play a role in aging, cancers and various disease processes. (Rudrappa, 2018)

• Bitter melon stimulates smooth digestion and peristalsis of food through the bowel until it is excreted from the body. Thus, it helps in relieving indigestion and constipation problems. (Rudrappa, 2018)

• Further, it has small amounts of B-complex vitamins such as niacin (vitamin B-3), pantothenic acid (vitamin B-5), pyridoxine (vitamin B-6) and minerals such as iron, zinc, potassium, manganese and magnesium. (Rudrappa, 2018)

• Early laboratory tests suggest that certain phytochemical compounds in bitter melon might be effective in the treatment of HIV infection. (Rudrappa, 2018)

Potential risks and complications

Use bitter gourd with caution beyond occasional use in your diet. Bitter gourd can cause side effects and interfere with other medications. (Natalie Silver, 2018)

Some of the risks and complications of bitter melon include:

• Diarrhea, vomiting, and other intestinal issues.

• Dangerous lowering of blood sugar if taken with insulin

• Liver damage

• Favism (which can cause anemia) in those with G6PD deficiency

• Mixing with other drugs to alter their effectiveness.

• Problems in blood sugar control in those who have had recent surgery (Natalie Silver, 2018)

Problem statement

There are many studies that support about bitter gourd and some of them are about the studies of bitter Gourd Taxonomy and morphology, showing us that bitter gourd has various varieties and is a very much abundant vegetable, which shows that of bitter gourd horticulture explaining its Climate and soil, culture, harvest and many more of bitter gourd. However, despite many researchers being done regarding Bitter Gourd, studies on its preference and its products are low, so it is a need to see whether bitter Gourd and its products are known by people and their approval on bitter gourd products, to see if they see the light of bitter gourd on health benefits. (Charlebois, et al., 2011)

Justification

Bitter gourd is a vegetable that is a member of the Cucurbitaceous family and is a vegetable known for various medical purposes. The medical purposes would be lowering blood sugar level, lowering blood cholesterol level and many more like anti-inflammatory response ability.

Although Bitter Gourd has good impact on the health and bitter gourd being a highly nutritional vegetable, it was encountered that since bitter gourd is highly nutrient and has so many beneficial values but there were not many numbers of research conducted in order to utilize its benefits in Sri Lanka. Therefore, it is important to conduct research on bitter gourds. This would lead to utilize the goodness of bitter gourd.

Research Question

1. Do people eat/consume bitter gourd cooked or as a market product?

2. What is the people's attitude regarding bitter gourd and its products?

3. What perception does the general public have regarding bitter gourd and its products?

4. Are people aware of the basic health benefits of bitter gourd?

Conceptual Framework

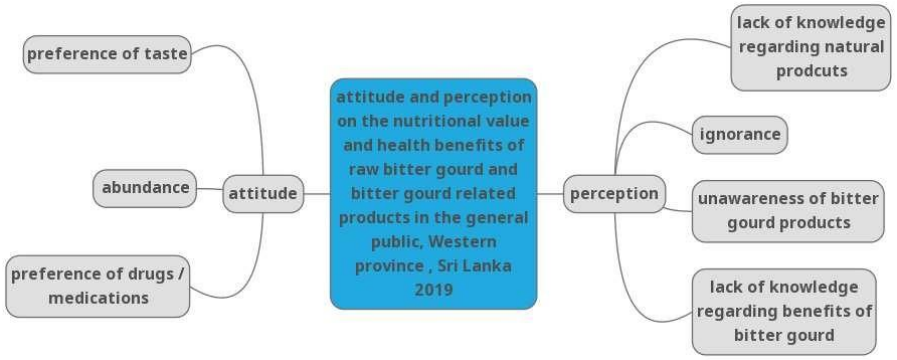

Figure 1: Conceptual Framework

Objectives

• General Objective -

1. To study the attitude and the perception on the nutritional value and health benefits of raw bitter gourd and bitter gourd related products.

• Specific Objectives -

1. To assess their preference towards bitter gourd.
2. To assess the awareness of bitter gourd products in general public in Western province.

LITERATURE REVIEW

Bitter gourd is a vegetable that is almost grown all over the world. The vegetable has a significant number of bioactive compounds like ascorbic acid. This fruity vegetable has fruits, seeds, leaves, vines and roots that are used for various medicinal purposes and bitter gourd is not only used for medicinal purposes but also in therapeutic purposes. Due to the tremendous advantages of bitter gourd, people have tried to investigate building many products of bitter gourd. When developing a product, it is essential to always look at how the product will benefit people. (Sorifa, 2018). Bitter gourd is a vegetable that has a higher amount of nutrients in its immature state as well. There are many types of bitter gourd, they as you can see that were used to check anti-diabetic compounds and vitamin C from germplasm-2 from Indonesia and 6 from India. The results showed that bitter gourd fruit had higher contents, than in its leaf. (Goo, et al., 2016). According to the research done on Anti-diabetic effects of ethanol extract from bitter gourd in mice fed a high-fat diet, the present investigation expected to decide the impact of bitter gourd, a prominently utilized natural product in Bangladesh and a few other Asian nations, on high- fat-diet-prompted type 2 diabetes. To research the impact, ethanol separated from severe gourd as a dietary enhancement with mouse chow was utilized. Bitter gourd was found to altogether constrict the high-fat eating regimen - initiated body weight and absolute fat mass. Bitter gourd additionally successfully decreased the insulin opposition initiated by the high fat diet. Besides, dietary supplementation of bitter gourd was very powerful in expanding insulin affectability and lessening hepatic fat and heftiness. These outcomes show that bitter gourd could be powerful in constricting sort 2 diabetes and could in this way be a preventive measure against sort 2 diabetes. (Yoon, et al., 2017)

As mentioned on research done on Anti diabetic effects of Momordica charantia (bitter gourd) and its medicinal potency, Diabetes mellitus is among the most widely recognized turmoil in created and creating nations, and the malady is expanding quickly in many parts of the world. It has been assessed that up to 33% of patients with diabetes mellitus utilize some type of reciprocal and elective drug. One plant that has gotten the most consideration for its enemy of diabetic properties is bitter gourd, Momordica charantia usually alluded to as unpleasant gourd, karela and resin pear. Its organic product is additionally utilized for the treatment of diabetes and related conditions among the indigenous populaces of Asia, South America, India and East Africa. Rich pre-clinical examinations have reported in the counter diabetic and hypoglycemic impacts of Momordica charantia through different hypothesized instruments. In any case, clinical preliminary information with human subject is constrained and imperfect by poor examination plan and low measurable power. The present audit is an endeavor to feature the anti-diabetic movement just as photochemical and pharmacological reports on Momordica charantia and calls for better-structured clinical preliminaries to additionally clarify its conceivable remedial consequences for diabetes. (Joseph & Jini, 2013)

Secondary research done on the effect of bitter gourd (Momordica charantia) in patients with diabetes mellitus, they focused on PubMed, EMBASE and the Cochrane Library from origin to July 2013 with no dialect limitations for randomized controlled preliminaries assessing severe gourd to no treatment in patients with sort 1 or type 2 Diabetes. Study determination, information extraction and legitimacy of each article were freely evaluated by two agents. Articles were evaluated for legitimate arbitrary grouping age, allotment covering, blinding, particular revealing and culmination of results answering to survey the hazard for inclinations. The glycemic consequences of each randomized controlled preliminaries were dissected to yield weighted mean contrasts and 95% certainty interims. The result was, each with 40– 66 members, pursued somewhere in the range of 4 and 12 weeks were distinguished in this meta-investigation. By a large danger of predisposition for each article included was resolved to be hazy. Altogether, 208 members with sort 2 diabetes mellitus (mean period of 56.5 years) were assessed. Contrasted and no treatment, unpleasant gourd did not altogether bring down A1C (weighted mean differences −0.13%, 95% confidence intervals

−0.41 to 0.16) nor fasting plasma glucose 47 (weighted mean differences 2.23 mg dl−1, 95%

confidence intervals −14.91 to 19.37). (Yin, et al., 2014)

Furthermore, with referred to the research done on an optimized aqueous extraction of saponins, which is a toxic compound present in bitter gourd that makes foam when shaken in water, to produce saponin-enriched bitter gourd powder. This study was made to optimize the aqueous extraction of saponins from bitter gourd, and produced a powder using spray drying method and compared the powder's physical properties, as well as the components and antioxidant capacity with aqueous and ethanol freeze-dried bitter gourd powders and with commercial powder. The results of the study were that the aqueous extraction of saponins. from bitter gourd made using the spray drying method had a high-quality powder in terms of saponins, the target compounds and antioxidant capacity. (Sing P., et al., 2014). Another study done on a juice product with a combination of strawberry, loquat, mulberry and bitter gourd, explains

that the administration before endotoxin treatment in vitro alleviate LPS- induced inflammation of peritoneal macrophages via decreasing the secretion of pro-inflammatory (increases worse the disease conditions) cytokines (IL-1β, IL-6, or TNF-α) and/or increasing the secretion of anti-inflammation (reduces inflammation and promotes healing) cytokine (IL-10). (Lin & Ching-Yin Tang, 2008). Pancreatic cancer is one of the most lethal malignancies, and resistance towards gemcitabine, which is a medication used during chemotherapy cancer, is the main cause for dismal rate of survival in P. Cancer patients. Incapacitating this resistance had been a major challenge to treat this lethal malignancy. The study and research done on this connection on how the bitter gourd juice helps in targeting molecular mechanism underlying gemcitabine resistance in pancreatic cancer cells. However, the overall result if the study exposes that the novel mechanism of gemcitabine resistance in P. Cancer cells which targeted by bitter gourd juice, with also considering the poor survival rate in P. Cancer patients, it is said that this study could have a high translational potential in controlling this deadly malignancy. (Somasagara, et al., 2015). As explained in another study, there has been demonstration done using bitter gourd juice and it has been explained and concluded that bitter gourd juice possesses strong efficacy against human pancreatic carcinoma cells without any noticeable side effects. Molecular studies reveals that the bitter gourd juice activates AMPK (Adenosine Monophosphate-Activated Protein Kinase), which plays a large role in cellular energy homeostasis that would be largely to activate glucose and fatty acid uptake and oxidation when cellular energy is low. Overall, the study proves that the bitter gourd activates AMPK in pancreatic carcinoma cells both in vitro and in vivo and induced strong apoptotic death. Considering the short survival rate and the high mortality due to pancreatic cancer, bitter gourd juice should be widely consumed and for health benefits could have significant translational relevance in managing the deadly malignancy. (M, et al., 2013)

The rising epidemic of obesity is associated with cognitive decline and is considered as one of the major risk factors for neurodegenerative diseases. Increased metabolic flux to the brain during over nutrition and obesity can orchestrate stress response, blood-brain barrier disruption, recruitment of inflammatory immune cells from peripheral blood and microglial cells. (Specialized population of macrophages that are found in CNS, which remove damaged neurons and infections and are important for maintain the health of CNS) activation leading to neuron inflammation. However, the study done on "bitter gourd attenuates high-fat diet- associated oxidative stress and neuron inflammation", concludes that the functional food bitter gourd offers a unique therapeutic strategy to improve obesity-associated peripheral inflammation and neuron inflammation. (Nerurkar, et al., 2011). According to the International Journal of Molecular Sciences "Flavonoids and phenolic compounds are important components of Momordica charantia (bitter gourd). They include gallic acid, protocatechuic acid, gentistic acid, (+)-catechin, vanillic acid, syringic acid, (−)- epicatchin, p-coumaric acid, benzoic acid, sinapinic acid, o-coumaric acid, chlorogenic acid, t-cinnamic acid and t-ferulic acid." (Jia, et al., 2017). Therefore, overdose in flavonoids may cause inhibit the promotion stage of carcinogenesis by inhibiting oxygen radical-forming enzymes or enzymes that contribute to DNA synthesis or act as ATP mimics and inhibit protein kinases that contribute to proliferative signal transduction. Finally, they may prevent tumor development by inducing tumor cell apoptosis by

inhibiting DNA topoisomerase II and p53 down regulation or by causing mitochondrial toxicity, which initiates mitochondrial apoptosis. While most flavonoids/phenolic are considered safe, flavonoid/phenolic therapy or chemo-preventive use needs to be assessed as there have been reports of toxic flavonoid-drug interactions, liver failure, contact dermatitis, hemolytic anemia, and estrogenic-related concerns such as male reproductive health and breast cancer associated with dietary flavonoid/phenolic consumption or exposures. (Galati & Brien, 2004)

As referred to Wiley food science and nutrition "The total, soluble, and insoluble oxalate contents of fresh and wok-fried bitter gourd (Momordica charantia) fruits were extracted and measured using high-performance liquid chromatography. Frozen bitter gourds were imported from Vietnam, and two cultivars characteristic of bitter gourd fruits grown in India and Malaysia were grown locally in the North Island of New Zealand. The mean total oxalate contents of ripe fruits from Vietnam, India, and Malaysia were 85.90 ± 8.60 mg/100 g wet matter (WM), while the mean total oxalates fell to 88.06 ± 0.95 mg/100 g FM when the fruits were wok fried. The mean soluble oxalate content of the total oxalate was 54.42% of the ripe fruits and 58.14% of the wok-fried fruits. The three cultivars of bitter gourds were processed into juice by the addition of standard ingredients and then processed through a screw press to remove excess fiber. The final juices had an overall mean value of 27.11 mg of total oxalates/100 g WM; the mean soluble oxalate content was 85.5% of the total, which was much higher than that measured in the cooked gourds (mean 70.7%). (Perez, et al., 2019). Oxalic acid or oxalate is highly irritating and corrosive. Ingestion and absorption of oxalate cause acute hypocalcaemia resulting from precipitation of the insoluble calcium oxalate salt. Calcium oxalate crystals may then deposit in the brain, heart, kidneys, and other sites, causing serious systemic damage. (Olson & hung, n.d.)

There is "16.9% of who had hypoglycemic episodes identified consumption of certain non- prescribed native food items as a hypoglycemia precipitating factor. Furthermore, consumption of non-prescribed native food items was the only cause recognized in 10% of those who had hypoglycemic episodes. Commonly used such food items include 'Karawila' (Momordica charantia) (54.5%), 'Thebu' (Costusspeciosus) (52.3%), 'Kothalahimbutu' (Salaciaprinoides) (11.4%), 'Kowakka' (Cocciniagrandis) (6.8%) and 'Madatiya' leaves (Adenantherapavonina) (4.5%)." (Bmcendocrdisord, 2019). Related to the study done on research in high-fat-fed female mice "Artemisia dracunculus L. supplementation resulted in increased body weight and adiposity, while bitter gourd did not induce changes in these parameters. Pyruvate tolerance testing indicated that both supplements increased hepatic glucose production. Both supplements induced a significant suppression in fatty acid oxidation in skeletal muscle homogenates treated with pyruvate, indicating enhanced metabolic flexibility. Artemisia dracunculus L. reduced lipid accumulation in skeletal muscle, while bitter gourd induced a downward trend in lipid accumulation in the skeletal muscle and liver. This was accompanied by transcriptional regulation of autophagic genes by bitter gourd in the liver. (Kwatra, et al., 2013). According to Saudi journal of biological sciences, component called "Carotenoids found in the fruit and different organs of bitter gourd (Momordica charantia). (DM, et al., 2017). If we overdose the carotenoids, it will cause "Carotenemia". "Carotenemia is a clinical condition characterized by yellow pigmentation of the skin (xanthoderma) and increased beta-

carotene levels in the blood. In most cases, the condition follows prolonged and excessive consumption of carotene-rich foods." (Schwartz, 2018). It is important that a certain herbal medication goes through with a reference from pharmacists. Bitter gourd has been found to lower the blood glucose level and the use of such herbal product should be seen clearly when taking for such chronic diseases. (JD & B, 2014)

Bitter gourd has added value in nutritional composition since it is high, due to the presence of antioxidants. These antioxidants according to research show that they are present in the pericarp and seeds of bitter gourd. Through research done on mice, where the mice were fed with high fat diet, and later consumption of bitter gourd showed a reduction in blood glucose levels and that bitter gourd has contribution in the glucose metabolism associated pathways. It is also found that oil of bitter gourd regenerates the skin of rabbits. Bitter gourd has an advantage on the pharmacological side where it contributes to the anti-diabetic potency. Bitter gourd having a unique medicinal property on anti-diabetic, research shows that bitter gourd also contributes towards Anti-bacterial activity, this was shown by taking the extract of bitter gourd leaves where the methanol, ethanol and water showed inhibition activity towards microorganisms, not only have this proven against anti-bacterial activity but was also used against HIV and as anti- cancer and anti-tumor properties. Bitter gourd is consumed differently. They are consumed in fresh or in different types of recipes such as soup, salads, stir fried, boiled, steamed, microwave, juiced, pickled, snacks, curries, bakery products, stuffed products of meat and oven dried to consume as tea. Generally bitter gourd is consumed as a juice, in other words as a beverage. This is due to the bitter taste of bitter gourd. It is shown that the juice had potassium metabisulfite and had a higher nutrient stability than Na-benzoate. On the contrary, bitter gourd extract of 15% with artificial sweetener was developed functional and dietetic beverage and it will be refrigerated temperature for six months with good flavor and palatability as well as nutritional properties. Bitter gourd was dehydrated in different ways to check which method had the less effect on not losing nutritional composition and they found out that cabinet drying was best. Bitter gourd chips were made through Osmo-air drying where soaking with 0.2% KMS for 10 minutes followed by 2%, 6%, 10% of NaCl and 1%, 3% and 5% acetic acid for 90 minutes, blotting and dried at 60 C for 8 hr. Bitter gourd slices which is also freshly cut bitter gourd slices kept in modified package with low density polythene bags. (Sorifa, 2018). When looking into the bitter gourd products available. It was found out that that a certain website has 261 products of bitter gourd, also it showed that they had bitter gourd powder for skin care and for 1 kilogram the price was of US $8-36. Mostly the bitter gourd was available as powder, also tea, chips, and capsules. The website offers 19% of bitter gourd in beauty products, 13% are regulation of blood system, and 9% are vegetable seeds. Bitter gourd products are most popular in the domestic market, North America, and Eastern Europe. (Biotropia, 2017)

METHODOLOGY

Study Design

A research configuration is a plan of movement that controls the researchers in the whole system of information gathering and investigation according to the research destinations and research questions. It clears up the frameworks used by the analysis in the assurance of respondents, information gathering, information examination and how to report the revelations. This examination is a

quantitative investigation, to check diverse parts of the attitude and perception of bitter gourd in Western Province Sri Lanka. A quantitative investigation is an endeavor to comprehend circumstances and logical results connections anyway the analyst can't control how the subjects are appointed to gatherings and which treatments each gathering gets. Besides a self-administrated survey would be made and distributed to the general population in Western province Sri Lanka by social media. The method of sampling will be a snowball sampling method. (Kumar, 2011).

Sample size

Population in Colombo district (Statistics, 2018)	
Age Range	**Population**
15-19	175847
20-24	194054
25-29	186683
30-34	191618
35-39	171166
40-44	165624
45-49	151942
Total Population	**1236934**

Table 2: Population in Colombo district

Margin of Error – 5% Confident level – 95%

Minimum sample size – 385 (According to Raosoft)

Inclusion Criteria:

People between ages 18 - 50 will be included.

Exclusion Criteria:

Children under 18 and adults above 51 will be excluded. Participants from other areas, who are not in Colombo district.

Incomplete google forms.

Data Collection Method

A self- administered questionnaire will be distributed as google forms to citizens

Study Population

General population in Colombo district, Sri Lanka

in the Colombo district through social media, through a snowball sampling method.

Data Analysis Plan

The collected data will be filtered and analyzed accordingly using MS Excel

RESULTS

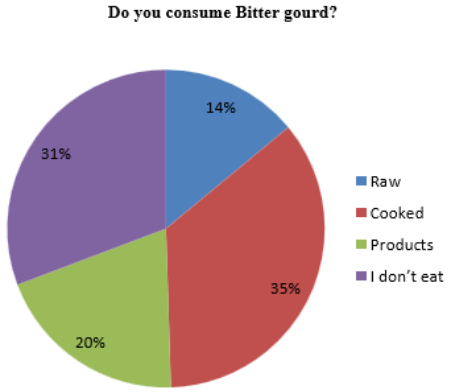

Figure 2: The way of consuming bitter gourd

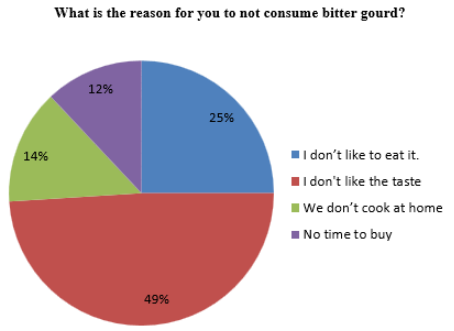

Figure 3: Reason for not to consume bitter gourd

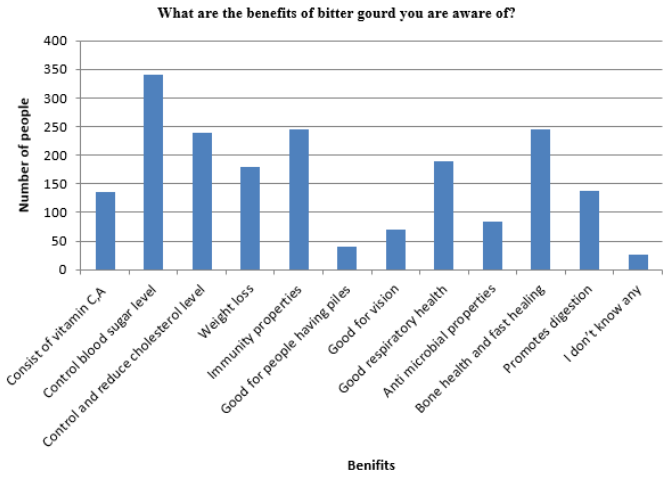

Figure 4: Benefits of bitter gourd

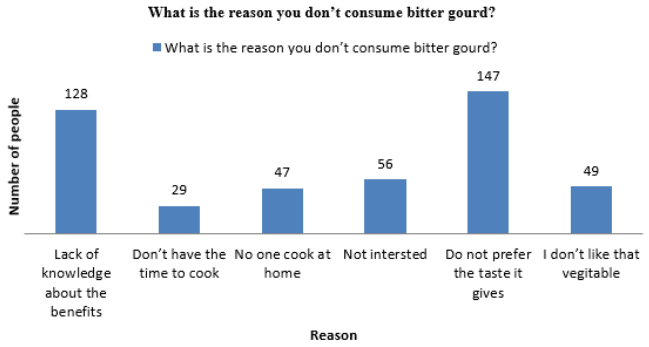

Figure 5: Reasons for not to consume bitter gourd

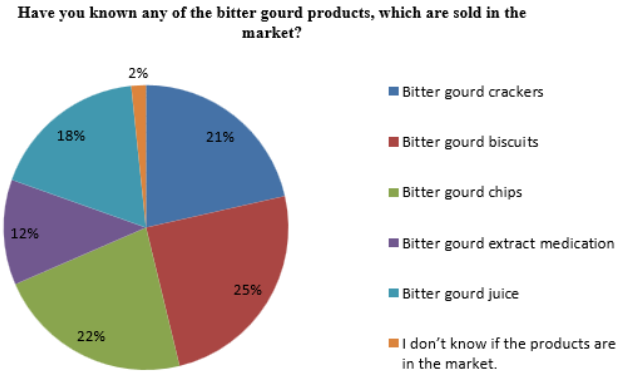

Figure 6: Awareness about bitter gourd products that are available in the market

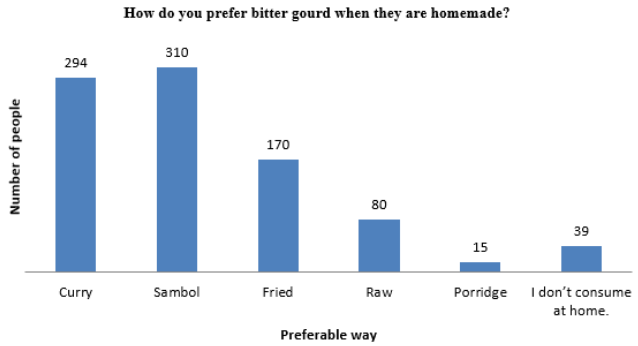

Figure 7: The preferable way of bitter gourd (Homemade)

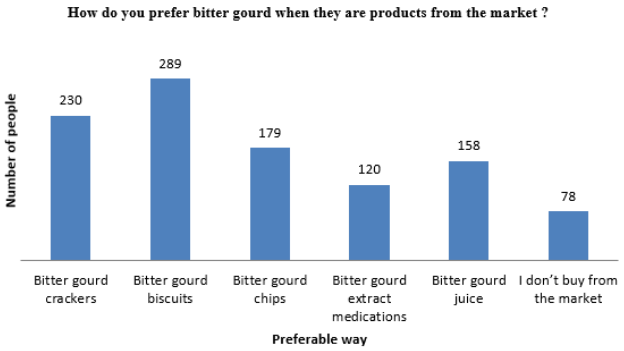

Figure 8: The preferable way of bitter gourd (Market)

DISCUSSION AND CONCLUSION

Discussion

The research study aimed to investigate the attitudes and perceptions of the general public in the Colombo District, Sri Lanka, regarding the nutritional value and health benefits of raw bitter gourd and bitter gourd-related products in the market. The problem statement highlighted the lack of research on bitter gourd preferences and products despite its numerous potential health benefits. The justification emphasized the importance of conducting research to harness the goodness of bitter gourd and utilize its benefits in Sri Lanka. The results of the study provide valuable insights into the consumption patterns and awareness of bitter gourd among the surveyed population. When asked about their consumption habits, 14% preferred consuming raw bitter gourd, while 35% opted for cooked preparations, and 20% consumed bitter gourd products. Surprisingly, 31% of respondents stated that they did not consume bitter gourd at all. This finding suggests that there may be a need to raise awareness and promote the consumption of bitter gourd in the Colombo District. Regarding the reasons for not consuming bitter gourd, the majority of respondents (49%) cited disliking the taste, followed by 25% who expressed a general dislike for the vegetable. Other reasons included not cooking at home (14%), and lack of time to buy bitter gourd (12%). These reasons highlight the need to address taste preferences and promote alternative cooking methods or pre-prepared bitter

gourd products to cater to busy individuals who may not have time to cook.

The survey also assessed respondents' awareness of the benefits associated with bitter gourd consumption. The results indicate that many individuals were aware of the various health benefits. The most recognized benefits included its ability to control blood sugar levels (340 respondents), reduce cholesterol levels (240 respondents), promote weight loss (180 respondents), and provide immunity properties (245 respondents). However, there were still 27 respondents who stated that they did not know any benefits of bitter gourd, highlighting the need for increased education and information dissemination. When asked about their knowledge of bitter gourd products available in the market, most respondents were aware of bitter gourd crackers (21%), bitter gourd biscuits (25%), bitter gourd chips (22%), and bitter gourd juice (18%). However, a small percentage (2%) claimed not to know if such products were available in the market. This finding suggests that there is a need for better promotion and visibility of bitter gourd products to enhance consumer knowledge and accessibility.

In terms of preferences for homemade bitter gourd preparations, the survey found that the most favored methods of consumption were bitter gourd curry (294 respondents) and bitter gourd sambal (310 respondents). Other preferred methods included fried bitter gourd (170 respondents), consuming it raw (80 respondents), and bitter gourd porridge (15 respondents). Notably, 39 respondents stated that they did not consume bitter gourd at home, indicating a potential opportunity to introduce and promote bitter gourd in different culinary contexts. Similarly, when it came to store-bought bitter gourd products, the survey revealed that bitter gourd biscuits (289 respondents), bitter gourd crackers (230 respondents), and bitter gourd chips (179 respondents) were the preferred choices. Bitter gourd extract medications (120 respondents) and bitter gourd juice (158 respondents) were also somewhat popular among the respondents. However, 78 respondents mentioned that they did not purchase bitter gourd products from the market, highlighting a potential gap in consumer engagement and marketing strategies.

CONCLUSION

In conclusion, this study examined the attitudes and perceptions of the general public in the Colombo District, Sri Lanka, regarding the nutritional value and health benefits of raw bitter gourd and bitter gourd-related products in the market. The findings shed light on the consumption habits, reasons for non-consumption, awareness of benefits, knowledge of bitter gourd products, and preferences for homemade and store-bought preparations. The results indicated a mixed response in terms of bitter gourd consumption, with a significant portion of the population not consuming bitter gourd at all. Taste preference emerged as a key factor influencing consumption patterns, while lack of awareness and time constraints were also mentioned as barriers. However, there was a considerable level of awareness regarding the health benefits associated with bitter gourd consumption, suggesting a potential market for promoting its nutritional value. To increase bitter gourd consumption, efforts should focus on addressing taste concerns, promoting alternative cooking methods, and raising awareness of the available bitter gourd products in the market. Targeted educational campaigns could help bridge the knowledge gap and highlight the diverse health benefits of bitter gourd, including its ability to control blood sugar and cholesterol levels, aid in weight loss, boost immunity, and promote respiratory and bone health.

Moreover, the study revealed preferences for specific bitter gourd preparations, such as curry and sambal, both at home and in store-bought products. This information can inform marketing strategies and product development, aiming to meet consumer preferences and expand the range of bitter gourd offerings in the market. This research contributes valuable insights into the attitudes and perceptions of the general public in the Colombo District regarding bitter gourd and its related products. The findings can serve as a basis for further research, policy formulation, and marketing strategies to promote bitter gourd consumption and capitalize on its nutritional value and health benefits in Sri Lanka.

Future work

• Consumer Education and Awareness: Develop and implement educational campaigns to increase public awareness of the nutritional value and health benefits of bitter gourd. Assess the effectiveness of these initiatives in changing attitudes and consumption patterns.

• Product Development and Innovation: Explore the creation of new bitter gourd-based products that cater to different tastes and preferences. Evaluate the feasibility of ready-to-eat options with improved flavors and packaging.

• Culinary and Dietary Applications: Investigate traditional and innovative culinary uses of bitter gourd in Sri Lankan cuisine. Identify ways to incorporate bitter gourd into various recipes and dishes to enhance its acceptance.

• Health Benefits and Clinical Studies: Conduct further research and clinical studies to understand the specific health benefits of bitter gourd. Investigate its effects on blood sugar control, cholesterol reduction, weight management, and immune function.

• Consumer Preferences and Market Analysis: Conduct market research to understand consumer preferences and factors influencing the acceptance of bitter gourd products. Develop effective marketing strategies to promote bitter gourd in the market.

• Cultivation and Agricultural Practices: Explore sustainable cultivation practices for bitter gourd, including optimal farming techniques and pest management strategies. Increase production to meet the demand for this nutritious vegetable.

• Comparative Studies: Compare attitudes and consumption patterns of bitter gourd among different demographic groups. Tailor interventions to promote bitter gourd consumption among specific target populations.

• Long-term Health Impact: Conduct longitudinal studies to assess the long-term health effects of regular bitter gourd consumption. Monitor health outcomes and evaluate the sustainability of bitter gourd interventions in promoting healthy lifestyles.

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