A Study on Cocoa Consumption Patterns and Preferences Across Different Age Groups and Genders and its Impact on Health

Shivani B.[1], Aparna S.[2], Abirami .S.P[3]
[1]*UG student, Department of Food Science, M.O.P. Vaishnav College for Women*
[2]*UG student, Department of Food Science, M.O.P. Vaishnav College for Women*
[3]*Assistant Professor, Department of Food Science, M.O.P. Vaishnav College for Women*

Abstract **- AIM- To study the preference and consumption patterns of cocoa products among different age groups and gender and find its impact on human health. OBJECTIVE- To understand the preference for different cocoa products among diverse age groups and genders. To understand the consumption patterns of cocoa products. To know the impact of cocoa on human health. MATERIALS AND METHODS- It is a prospective observational study carried out using a randomized sampling technique through an online Google form survey. The questionnaire was prepared to observe the cocoa consumption patterns and preferences and its impact on health among the population. RESULT- The presence of polyphenols and antioxidants in cocoa and its products reduce the risk of getting affected by conditions like cardiovascular diseases, stroke and diabetes. CONCLUSION- The consumption of cocoa along with a healthy lifestyle and dietary patterns have proven to reduce the risk of these diseases, although a recommended dietary intake of cocoa has not been determined yet. It can also be concluded from the survey that cocoa also helps tackle mood swings in individuals. The amino acid tryptophan present in cocoa helps in the production of serotonin, a neurotransmitter that brings the feeling of happiness.**

Index Terms **- Cardiovascular diseases, Chocolate, Cocoa, Consumption patterns, Polyphenols.**

I.INTRODUCTION

Theobroma cacao also known as Cocoa which means the "Food of the Gods" in Greek is a tropical evergreen plant. Its seeds, called cocoa beans, are processed into cocoa powder, cocoa butter, and chocolate. Cocoa originated from the Amazon and Orinoco valleys [1]. It is one of the most important agricultural export commodities in the world. The major cocoa exporting countries globally include Ivory Coast, Germany, Netherland, Belgium and Ghana as per the 2019 APEDA records [2].

The cultivation of cocoa requires a suitable climate, and this occurs mainly in the area delimited by the Tropic of Cancer and Capricorn. During cultivation, cocoa requires high humidity, which usually oscillates between 70% and 80% during the day and between 90% and 100% during the night [3].

Processing of Cocoa

To boost the palatability of the seeds and obtain chocolate flavours, the cocoa beans undergo sophisticated processing after harvesting that affects their natural chemical and physical qualities. The primary processing involves the fermentation and drying stages. The secondary processing involves roasting, alkalization, and conching.

1. Fermentation:

This is a key stage that supports the removal of the pulp and subsequent drying. Fermentation initiates the formation of taste precursors, colour development, decreasing bitterness and astringency. Complex biological events occur during fermentation, generating cocoa flavour precursors such as reducing sugars and nitrogenous chemicals.

2. Drying:

To avoid over-fermentation, mould infection, and bean damage during storage, the moisture level of the beans is lowered to an optimum of about 7 to 7.5% during the drying step. This phase is also important for suppressing bitterness, astringency, and acidity, as well as developing the distinctive flavour and brown colour.

3. Roasting:

The roasting of cocoa beans is the most important stage of bean processing. During roasting, the typical roast and chocolate flavour and the specific texture of the beans are developed, undesired volatiles (acetic acid) are eliminated, and the moisture content is reduced to 1 to 2%.

4. Alkalization:

Alkalization is used to improve the colour and flavour of cocoa and to make the cocoa powder more dispersible in liquids. Alkalization, often known as "Dutching," is the process of treating cocoa mass, liquor, or powder with alkali. It can also be done before roasting.

5. Conching:

Conching is a multi-day heat treatment process that involves mixing that contributes to the creation of the final flavour and smooth texture. All off flavours are reduced on completion of this step [4], [5], [6].

The cocoa beans are peeled, ground and pressed to obtain chocolate and other by-products. Cocoa powder, Cocoa butter and Chocolate are obtained by pressing the cocoa beans.

Flavour is a critical property of cocoa quality and one of the most important consumer metrics. The distinctive cocoa and chocolate flavour profile is produced during the post-harvest processing procedures of beans, which primarily comprise fermentation, drying, and roasting. It's most commonly consumed for its pleasant, stimulating, and euphoric properties [6].

Chocolate is rich in polyphenols. Polyphenols appear to play a function in the prevention of cardiovascular disease, cancer, and osteoporosis and a role in the prevention of neurodegenerative illnesses and diabetes mellitus, according to recent research and current data [7]. Flavanols found in cocoa have been associated with blood pressure lowering properties due to their stimulation of nitric oxide dependent vasodilation [8]. Cardiovascular diseases being more prevalent these days can be controlled or prevented to a good extent by the consumption of phenolic compounds like flavonoids. Consuming chocolate in moderation (1–6 servings/week) may be optimal for the prevention of these burdensome diseases. However, an RDA has not been prescribed for it [9]. The recent discovery of the biologically active compounds such as the phenolic present in cocoa stimulated the research on its effects in ageing, oxidative stress, blood pressure regulation, and atherosclerosis [10].

II. MATERIALS AND METHODS

The design of the study was a prospective observational study. A randomized sampling technique was used. This study was carried out through an online Google form survey. The survey population included people above the age of 11 and both genders. Children below the age of 11 and those not willing to participate were excluded from the study. A total of 101 responses were recorded within a period of 1 week. The questionnaire prepared to observe the cocoa consumption patterns and preferences and its impact on health among the population, consisted of 2 sections. The first section consisted of 7 questions related to the consumer preferences and patterns of cocoa consumption. The second section included 6 questions to analyse the impact of cocoa on human health. The responses received were analyzed, interpreted and the results were obtained.

III. RESULTS AND DISCUSSION

The study was conducted to find the cocoa consumption patterns and preferences and their impact on health. A total of 101 responses were collected by randomized sampling technique through a Google form questionnaire.

Out of the total 101 responses, 69 (68.31%) were females and 32 (31.68%) were males. 5.9% of the total responses recorded were between the age group of 11-17 years, 54.5% were from 18-25 years, 7.9% between 26-35 years, 9.9% in the age group of 36-45 years, 16.8% were between 46-60 years, 3% were from 60-70 years and 2% were above the age of 70 years.

While looking into the consumption preference for chocolate, it was inferred that 49.5% prefer to consume dark chocolate, 31.7% prefer milk chocolate, while 12.9% prefer white chocolate. It was also found that most of the respondents preferred to consume chocolates without wafers. When it came to chocolate flavour pairings, it was seen that Saffron and Almonds were the most popular as it was preferred by 63 respondents (62.4%). Fig & Honey were preferred by 28 respondents (27.7%) whereas 23 respondents (22.8%) preferred Rose & Cardamom.

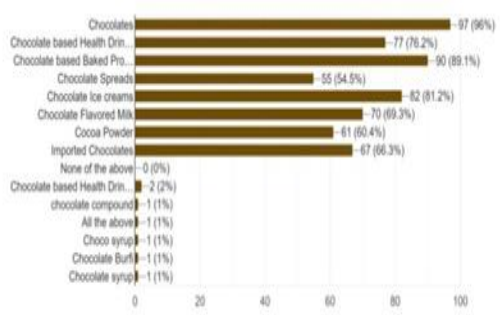

Fig 1: Cocoa product consumption (n=101)

Fig 1- it can be inferred that almost the entire study population consumes chocolates (96%). Chocolate based baked products (89.1%), ice cream (81.2%), health drinks (78.2%), and flavoured milk (69.3%), chocolate spreads (54.5%), cocoa powder (60.4%), and imported chocolates (66.3%) have also been consumed by a large part of the respondents. It is seen that all the respondents consume at least one of the various cocoa-based products mentioned.

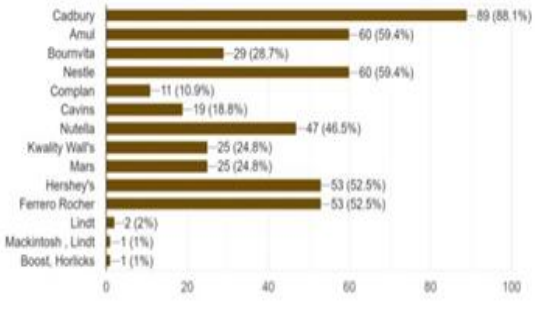

Fig 2: Brand preference (n=101)

Fig 2- The most preferred brand of chocolate among the study population was found out to be Cadbury (88.1%). Amul (59.4%), Nestle (59.4%), Hershey's (52.5%) and Ferrero Rocher (52.5%) are the other preferred brands of the various cocoa products. Lindt, Mackintosh's have also been mentioned by the respondents.

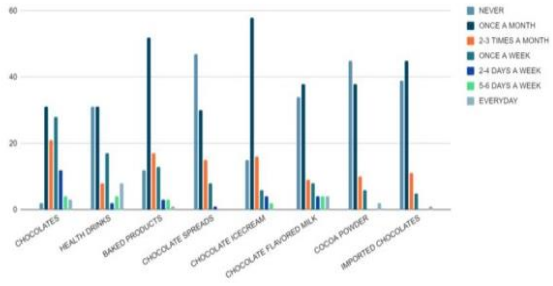

Fig 3: Consumption frequency (n=101)

Fig 3- The consumption frequency for the various cocoa products of the respondents can be inferred from the above graph (Figure 3). The highest frequency of consumption for each cocoa product is as follows: Chocolates- Once a month (30.7% of the respondents), Health drinks- Never and Once a month(30.69% of the respondents), Baked products- Once a month(51.48% of the respondents), Chocolate spreads- Never(46.53% of the respondents), Ice-creams- Once a month(57.42% of the respondents), Flavored milk- Once a month(37.62% of the respondents), Cocoa powder- Never(44.55% of the respondents), Imported chocolates- Once a month(44.55% of the respondents).

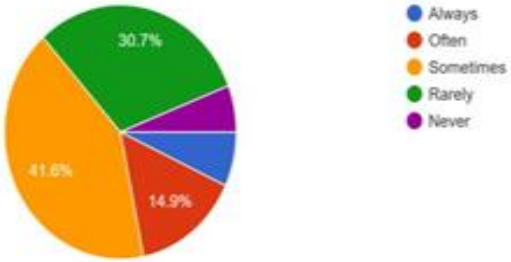

Fig 4: Mood swing frequency (n=101)

Fig 4- it was observed that 30.7% of the respondents experience mood swings rarely and 41.6% respondents go through mood swings sometimes. 84.2% of the respondents also responded that they feel happy and energetic on consuming cocoa products.

49.5% of the study population was aware of the health benefits of cocoa consumption and 50.5% believes cocoa consumption is moderately healthy. 87.1% of the respondents were found to be not suffering from any medical conditions like blood pressure, diabetes, stroke, or other heart conditions. However, 5.9% of the population suffered from blood pressure and 4% from diabetes. It was also found that there were no frequent consumers of alcohol, tobacco, or cigarettes

IV. CONCLUSION

Chocolate is a by-product of cocoa, it is obtained by combining cocoa liquor, cocoa butter, and sugar. There are various other products processed with cocoa as the major ingredient such as ice creams, health drinks, spreads, flavored milk, and baked products. It was found that only a very few were aware of the difference between cocoa products and chocolate and their health benefits. Most of the

respondents felt cocoa was not healthy and is a product consumed only for pleasure. Cocoa has been scientifically proven to improve moods and cope up with mood swings in humans; this study also proved that cocoa consumption has a positive impact on the respondent's mood.

The presence of certain drug-like chemical compounds present in cocoa, Anandamides - a cannabinoid-like fatty acid, Methylxanthines, Biogenic amines, and other alkaloids are drug-like compounds in cocoa responsible for lifting up one's mood.

Polyphenols are responsible for positive health benefits related to the consumption of cocoa. 49.5% of the respondents preferred and consumed dark chocolates, which are richer in polyphenols as compared to milk or white chocolates. This relates to the lower cases of cardiovascular diseases, strokes, diabetes, and other ailments amongst the respondents. However, cocoa alone does not prevent or reduce the risk of these diseases, other factors such as genetics, lifestyle and dietary patterns also play a significant role.

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