A COMPARATIVE STUDY ON ASSESSMENT OF EFFECT OF HIGH FAT, SALT AND SUGAR (HFSS) FOODS CONSUMPTION ON AGNI AMONG MIDDLE AGED (40-59 YEARS) AND OLDER ADULTS (60-70 YEARS)

[1]RIYA JAIN, [2]DR. REKHA BATTALWAR

[1]*Masters in Food and Nutrition, Department of Specialized Dietetics, SVT College of Home Science (Autonomous), SNDT Women's University, Juhu Tara Road, Santacruz (W), Mumbai 400049, India*

[2]*Associate Professor, Department of Food, Nutrition and Dietetics, Sir Vithaldas Thackersey College of Home Science(Autonomous), S.N.D.T. Women's University, Mumbai, Maharashtra, India*

ABSTRACT

The relation between food and health is mediated by Jāṭharāgni (the metabolic agent in Ayurveda). There are four different states of Jāṭharāgni viz, Mandāgni (mild or weak state of metabolic fire), Viṣamāgni (irregular state of metabolic fire), Tīkṣnāgni (sharp or intense state of metabolic fire), and Samāgni (Normal state of metabolic fire). Samāgni (Normal state of metabolic fire) is said to be the normal State and maintains the health of an individual."HFSS foods" are foods (packaged or unpackaged) that are low in proteins, vitamins, phytochemicals, minerals, and dietary fibre but high in fat (saturated fatty acids), salt, and sugar, as well as high in energy (calories), and are known to have a negative impact on health if consumed regularly or in large amounts."

Aim: A comparative study on assessment of effect of High fat, salt and sugar (HFSS) foods consumption on agni among middle aged (40-59 years) and older adults (60-70 years).

Objectives: 1.To assess the consumption patterns of HFSS in this a age group.

2. To analyse impact on Agni through HFSS food consumption.

3. To evaluate the type of Agni and compare the agnibala score between the two groups.

4. To assess dietary nutritional intake of the target population.

Method: A comparative study was carried out among 100 participants in Mumbai, Maharashtra. Middle aged (40-59 years) and elderly men and women (60-70 years) were included in the study. Convenience sampling was used. General information, Food frequency questionnaire (FFQ) and Agnibala Questionnaire were responded by the target group.

Results: There was a statistical significant positive correlation of Mandagni, Vishamagni, Tikshagni score with frequency intake of different categories of High fat, salt and sugar foods(p<0.05).The macronutrients of each individual gave an estimate of nutrient intake per day and how it was related to different classes of Agni.

Participants that consumed more number of calories, carbohydrates and fats had Mandagni and Tikshagni state of Agni.

Conclusion: Middle aged and elderly consuming HFSS foods had Agni related problems and digestive power was much weaker. Those who did not consume HFSS foods frequently, their agnibala was comparatively stronger. Some positive and negative correlations were found between Agni and HFSS foods. /HFSS meal patterns were also observed throughout the day.

KEYWORDS: High fat, salt and sugar(HFSS) foods, Agni , Agnibala score, Mandagni ,Samagni,Tikshagni, Vishamagni

INTRODUCTION

Ayurveda has described the set of important factors responsible for digestion & metabolism in our body as Agni. Ingested food is digested, absorbed and assimilated which is an unavoidable mechanism for the maintenance of life and is performed by Agni. Agni converts food in the form of energy which is responsible for all the vital functions of our body. The relation between food and health is mediated by Jāṭharāgni (the metabolic agent in Ayurveda). There are four different states of Jāṭharāgni viz, Mandāgni (mild or weak state of metabolic fire), Viṣamāgni (irregular state of metabolic fire), Tīkṣnāgni (sharp or intense state of metabolic fire), and Samāgni (Normal state of metabolic fire). Samāgni (Normal state of metabolic fire) is said to be the normal State and maintains the health of an individual. All the other states are considered as abnormal. If the Agni of a person is vitiated, then the whole digestive process in his body will be affected, resulting to the unhealthy condition of body. Thus, the Agni is believed to be 'mool' (base) of life (Deepak,G.et al,2022) "HFSS foods" are foods (packaged or unpackaged) that are low in proteins, vitamins, phytochemicals, minerals, and dietary fibre but high in fat (saturated fatty acids), salt, and sugar, as well as high in energy (calories), and are known to have a negative impact on health if consumed regularly or in large amounts. "Burgers, pizza, fries, chocolates, ice creams, and jams, among other foods, are not regarded good choices for meeting nutrient demands and should be consumed in moderation. The World Health Organization classifies such foods as HFSS foods, or foods that are "high in fat, salt, and sugar" (WHO). The term "junk food" is widely used around the world to describe foods that have little or no nutritional value but are heavy in salt, sugar, and fat.(Working Group Constituted by Ministry of Women and Child Development Government of India 2015).Sweets, salted snack foods, fried fast food, cookies, candy, chips, pizza, burgers, ice cream, milk shakes, soda, fizzy carbonated beverages, quick noodles, and other junk foods are examples of junk foods.(Sudeena S.et al,2020).The fat content has a high quantity of cholesterol. Sugar has a high calorie content, which can lead to obesity. Cholesterol and salt have been linked to a rise in blood pressure, stroke, and heart disease. Excess salt can also wreak havoc on kidney function. (Sudeena S.et al, 2020)

Rationale of the study is that this study will aid in determining the dietary nutrient intake and HFSS food patterns of the middle-aged and elderly population. This research will aid in determining how HFSS food impairs Agni function. HFSS food takes longer to digest and has a lot of fat, which is bad for the elderly, since they have a weak digestive system.

MATERIALS AND METHODS

A comparative study was carried out among 100 participants in Mumbai, Maharashtra. Middle aged (40-59 years) and elderly men and women (60-70 years) were included in the study. Convenience sampling was used. General information, Food frequency questionnaire (FFQ) and Agnibala Questionnaire were responded by the target group. Duration of the study was 3-4 months. Data collection was done in Offline mode via physical meet. Majority of the participants would be selected from known contacts of the research assistant i.e friends and family. Participants Information sheet and Consent Form was administered. The research proposal entitled with "A comparative study on assessment of effect of High fat, salt and sugar (HFSS) foods consumption on agni among middle aged (40-59 years) and older adults(60-70 years)"was approved by the ethics committee of K.G. Mittal Ayurvedic College, Mumbai. Data were analysed using SPSS version 25 for Windows (version 25, 2017, IBM Corporation, Armonk, New York, United States). Data presented as Mean±SD, Median (minimum-maximum) or frequency (%). Normality of continuous data was assessed with Shapiro Wilk test.

Frequency of HFSS, meal distribution and nutrient intake was compared between age groups using Mann Whitney U test. Cross tabulations were computed for categorical data and compared using Fisher's exact test/ chi-square test. Spearman correlation was used to analyse correlation of AGNI score with HFSS frequency, meal distribution and nutrient intake. $P < 0.05$ was considered to be statistically significant.

RESULTS

Some positive and negative correlations were found between Agni and HFSS foods. /HFSS meal patterns were also observed throughout the day. Food frequency consumption patterns and other lifestyle related information were taken into account.

Table 4.1: Demographic Information

Demographic category	Sub-categories	Percentage(%)
Age group	40 – 59 years	53
	60 – 70 years	47
Gender	Female	56
	Male	44
Community	Hindu	43
	Muslim	5
	Jain	39
	Sikh	4
	Christian	2
	Zoroastrian	7

As per table 4.1, Out of 100 participants, 56% were females and 44 were males.53 participants were from 40-59 years age group and 47 were from 60-70 years age group. Majority of them were Hindu.

Table 4.5: Correlation of Agni with high fat, salt and sugar (HFSS) food intake

Food items	Mandagni		Vishamagni		Samagni		Tikshnagni	
	Rho value	P value	Rho value	P value	Rho value	P value	Rho value	P value
Pizza	0.556	**0.001***	0.199	**0.047***	-0.671	**0.001***	-0.061	0.549
Chicken nuggets	0.065	0.520	-0101	0.318	-0.154	0.125	0.170	**0.091***
Fish and chips	0.121	0.231	-0.004	0.972	-0.208	**0.037***	0.068	0.502
Sausages	0.034	0.739	-0.091	0.366	-0.165	0.100	0.202	**0.044***
Burger	0.265	**0.008***	-0.047	0.642	-0.340	**0.001***	0.036	0.724
French fries	0.526	**0.001***	0.255	**0.011***	-0.608	**0.001***	-0.139	0.169
Chips and wafers	0.485	**0.001***	0.243	**0.015***	-0.657	**0.001***	-0.051	0.617
Tortilla chips/Nachos	0.526	**0.001***	0.265	**0.008***	-0.654	**0.001***	-0.147	0.144
Khari /butter	0.547	**0.001***	0.240	**0.016***	-0.687	**0.001***	-0.128	0.203
Pasta	0.492	**0.001***	0.216	**0.031***	-0.599	**0.001***	-0.154	0.127

Noodles	0.475	**0.001***	0.16	0.111	-0.580	**0.001***	-0.093	0.358
Chinese	0.553	**0.001***	0.257	**0.01***	-0.655	**0.001***	-0.162	0.107
Maggi	0.490	**0.001***	0.216	**0.031***	-0.598	**0.001***	-0.087	0.389
Breakfast meals	0.536	**0.001***	0.195	**0.052***	-0.652	**0.001***	-0.098	0.33
Frozen meals	0.545	**0.001***	0.177	**0.078***	-0.637	**0.001***	-0.133	0.188
Bhajis	0.485	**0.001***	0.162	0.108	-0.605	**0.001***	-0.035	0.732
Vada pav	0.536	**0.001***	0.215	**0.032***	-0.625	**0.001***	-0.091	0.369
Medu vada	0.537	**0.001***	0.196	**0.05***	-0.623	**0.001***	-0.113	0.263
Chaat	0.469	**0.001***	0.230	**0.021***	-0.590	**0.001***	-0.095	0.349
Bun maska	0.493	**0.001***	0.196	**0.051***	-0.612	**0.001***	-0.088	0.383
Frankie	0.458	**0.001***	0.204	**0.041***	-0.593	**0.001***	-0.066	0.517
Chinese bhel	0.474	**0.001***	0.309	**0.002***	-0.613	**0.001***	-0.127	0.209
Cakes and pastries	0.539	**0.001***	0.221	**0.027***	-0.653	**0.001***	-0.109	0.278
Donuts	0.511	**0.001***	0.205	**0.041***	-0.635	**0.001***	-0.093	0.359
Chocolates	0.548	**0.001***	0.255	**0.011***	-0.651	**0.001***	-0.13	0.199

Cookies	0.518	**0.001***	0.204	**0.042***	-0.672	**0.001***	-0.081	0.425
Icecream	0.486	**0.001***	0.154	0.126	-0.601	**0.001***	-0.06	0.556
Sugar sweetened beverages	0.485	**0.001***	0.176	**0.081***	-0.573	**0.001***	-0.097	0.336
Carbonated beverages	0.522	**0.001***	0.219	**0.028***	-0.658	**0.001***	-0.102	0.315
Sports drinks	0.515	**0.001***	0.177	**0.078***	-0.624	**0.001***	-0.063	0.533
Energy drinks	0.570	**0.001***	0.251	**0.012***	-0.646	**0.001***	-0.139	0.169

As per table 4.5, there was a statistical significant positive correlation of Mandagni score with frequency intake of pizza, burger, chips and wafers, tortilla chips, khari ,pasta, noodles, Chinese, maggi, breakfast meals, frozen meals, bhajis, vada pav, medu vada,chaat, bun maska, frankie, chinese bhel, cakes and pastries, cookies, sugar sweetened beverages, carbonated beverages, sports drinks, energy drinks ($p < 0.05$).This means that there was a significant relationship seen between mandagni score and intake of HFSS foods. When frequency intake of hfss foods increased, mandagni score also increased.

There was a statistical significant positive correlation of Vishamagni score with frequency intake of pizza, chips and wafer, tortilla chips, khari ,pasta, Chinese, maggi, vada pav,chaat, frankie, Chinese bhel, cakes and pastries, cookies, carbonated beverage, energy drink, ($p < 0.05$).This means that there was a significant relationship seen between Vishamagni score and intake of HFSS foods.When frequency intake of hfss foods increased, Vishamagni score also increased.

There was a statistical significant negative correlation of Samagni score with frequency intake of pizza, burger, fish and chips, french fries, chips and wafers, tortilla chips , khari ,pasta , noodles , Chinese, maggi, breakfast meals, frozen meals, bhajis, vada pav, medu vada,chaat, bun maska, frankie, chinese bhel, cakes and pastries, cookies, sugar sweetened beverages, carbonated beverages, sports drinks, energy drinks ($p < 0.05$).This means that there was a

significant relationship seen between Samagni score and intake of HFSS foods. When frequency intake of hfss foods decreased, Samagni score increased.

There was a statistical significant positive correlation of Tikshagni score with frequency intake of sausages.(p<0.05).This means that there was a significant relationship seen between Tikshagni score and intake of HFSS foods. When frequency intake of hfss foods increased, Tikshagni score also increased.

Table 4.8: Correlation of Agni with HFSS meal distribution patterns

Meal timings	Mandagni		Vishamagni		Samagni		Tikshnagni	
	Rho value	P value	Rho value	P value	Rho value	P value	Rho value	P value
Early Morning	0.468	**0.001***	0.176	**0.081***	-0.608	**0.001***	-0.006	0.952
Breakfast	0.439	**0.001***	0.182	**0.070***	-0.590	**0.001***	0.009	0.928
Mid-Morning	0.568	**0.001***	0.300	**0.002***	-0.653	**0.001***	-0.205	**0.041***
Lunch	0.557	**0.001***	0.264	**0.008***	0.625	**0.001***	-0.169	**0.093***
Snacks	0.469	**0.001***	0.238	**0.017***	-0.597	**0.001***	-0.063	0.532
Dinner	0.487	**0.001***	0.233	**0.020***	-0.621	**0.001***	-0.106	0.295
Bed Time	0.524	**0.001***	0.198	**0.049***	-0.615	**0.001**	-0.099	0.327

As per table 4.8, there was a statistical significant positive correlation of Mandagni score with frequency intake at early morning, breakfast, mid-morning, lunch snacks, dinner and bedtime.(p<0.05).This means that there was a significant relationship seen between mandagni score and HFSS meal distribution patterns. When frequency intake

of hfss foods patterns increased, mandagni score also increased.

There was a statistical significant positive correlation of Vishamagni score with frequency intake at mid-morning, lunch snacks, dinner and bedtime.(p<0.05).This means that there was a significant relationship seen between vishamagni score and HFSS meal distribution patterns. When frequency intake of hfss foods patterns increased, vishamagni score also increased.

There was a statistical significant negative correlation of Samagni score with frequency intake at early morning, breakfast, mid-morning, lunch snacks, dinner and bedtime.(p<0.05).This means that there was a significant relationship seen between samagni score and HFSS meal distribution patterns. When frequency intake of hfss foods patterns decreased, samagni score increased.

There was a statistical significant negative correlation of Tikshagni score with frequency intake at midmorning.(p<0.05).This means that there was a significant relationship seen between tikshagni score and HFSS meal distribution patterns. When frequency intake of hfss foods patterns decreased, tikshagni score increased.

Table 4.11: Mean frequency of Agni when classified according to age group

	40 – 59 years		60 – 70 years		Total (n=100)		P value
	Mean±SD	Median (min-max)	Mean±SD	Median (min max)	Mean±SD	Median (min-max)	
Mandagni	25.1±35.8	0(0-85)	28.4±36.2	5(0-90)	26.7±35.9	0(0-90)	0.488
Vishamagni	22.5±27.4	15(0-85)	27.1±28.9	15(0-90)	24.7±28.1	15(0-90)	0.256
Samagni	32.7±38	10(0-90)	27.6±35.2	5(0-90)	30.3±36.6	10(0-90)	0.541
Tikshagni	20.8±35.1	0(0-94.7)	17.8±34.7	0(0-100)	19.4±34.7	0(0-100)	0.233

As per table 4.11, there was no statistical significant difference observed of Agni when classified according to age group (p>0.05).

Table 4.13: Correlation of Agni with nutrient intake

	Mandagni		Vishamagni		Samagni		Tikshnagni	
	Rho value	P value	Rho value	P value	Rho value	P value	Rho value	P value
Energy(kcal)	0.356	**0.001***	0.074	0.464	-0.344	**0.001***	-0.120	0.234
Carbohydrate(g)	0.348	**0.001***	0.059	0.56	-0.321	**0.001***	-0.114	0.258
Protein(g)	-0.028	0.783	-0.197	**0.049***	0.104	0.301	0.143	0.157
Fat(g)	0.344	**0.001***	0.075	0.459	-0.310	**0.002***	-0.151	0.133
Sodium(mg)	-0.068	0.499	-0.036	0.72	0.025	0.802	0.123	0.222
Energy EAR percent	0.283	**0.004***	0.085	0.400	-0.325	**0.001***	**-0.055***	0.585
Protein percent	-0.099	0.327	-0.188	**0.061***	0.171	0.089	0.156	0.122
Percentage Energy Carbohydrate	0.174	**0.083***	0.087	0.391	-0.187	0.062	-0.101	0.318
Percentage Energy Protein	-0.240	**0.016***	-0.199	**0.048***	0.293	**0.003***	0.207	**0.039***
Percentage Energy Fat	0.212	**0.034***	0.125	0.215	-0.234	**0.019***	-0.168	**0.095***

As per table 4.13, there was a statistical significant positive correlation of Mandagni score with frequency intake of Energy, carbohydrate, fat, energy EAR percent, Percentage energy protein, percentage energy fat($p < 0.05$).This means that there was a significant relationship seen between Mandagni score and nutrient intakes mentioned above.

When frequency of nutrient intake increased, Mandagni score also increased.

There was a statistical significant negative correlation of Vishamagni score with frequency intake of protein, percentage energy protein($p<0.05$).This means that there was a significant relationship seen between Vishamagni score and nutrient intakes. When frequency of nutrient intake decreased, Vishamagni score increased.

There was a statistical significant negative correlation of Samagni score with frequency intake of Energy, carbohydrate, fat, energy EAR percent, Percentage energy protein, percentage energy fat($p<0.05$).This means that there was a significant relationship seen between Samagni score and nutrient intakes mentioned above. When frequency of nutrient intake decreased, Samagni score increased.

There was a statistical significant positive correlation of Tikshagni score with frequency intake of percentage energy protein ($p<0.05$). This means that there was a significant relationship seen between Tikshagni score and percentage energy protein .When frequency of nutrient intake increased, Tikshagni score also increased.

A high intake of salt (sodium chloride), which contains 40% sodium, predisposes to high blood pressure. According to the WHO, persons who consume fewer than 5 grammes of salt per day had a lower risk of cardiovascular disease, stroke, and coronary heart attack. It has been highlighted as one of the most cost-effective interventions that countries may implement to improve population health outcomes. Saturated fatty acids, monounsaturated fatty acids (MUFA), and polyunsaturated fatty acids comprise fats (PUFA).Carbohydrate consumption boosts blood glucose and produces a positive energy balance, which is one of the causes of obesity.(Senger et al,2019)

CONCLUSION

It can be concluded that the correlations between Agni, HFSS foods and nutrient intakes shows that Agni is a crucial component that aids in digestion and is in charge of metabolic functions. Middle aged and elderly consuming HFSS foods have Agni related problems and digestive power is much weaker. (Mandagni, Vishamagni, Tikshagni). Those who do not consume HFSS foods frequently, their agnibala is comparatively stronger which indicates that digestion and metabolism is good and maintained properly (Samagni).Limitation maybe that very few researches are done in the field of Ayurveda. There is very little information of Ayurveda and Nutrition together in correlation.

REFERENCES

1. Deepak, G., & Alok , A. (2022). CONCEPT OF AGNI - A CONCEPTUAL STUDY. Wjpmr.com. Retrieved 15April 2022, from https://www.wjpmr.com/admin/assets/article_issue/67042020/1588219483.pdf
2. S., S., & V.K, S. (2020). Harmful effects of junk food and healthy alternatives in ayurveda. International Journal of Advanced Research, 8(8), 285-291. doi:10.21474/ijar01/11491

3. Senger, A. (2019). Analysis of salt, total fat, trans fat and carbohydrate in junk food. www.cseindia.org. Retrieved from https://www.cseindia.org/analysis-of-salt-total-fat-trans-fat-and-carbohydrate-in-junk-food-9807

4. https://www.who.int/