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Assessment Of The Comparative Analysis Of The Ayurvedic Medicine And Pathya Aahar With Allopathic Medicine In Type 2 Diabetes Mellitus Individuals: A Cross-Sectional Comparative Study

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Abstract:

Background: Diabetes is one of the largest global health emergencies of this century, ranking among the 10 leading causes of mortality together with cardiovascular disease (CVD), respiratory disease, and cancer. Ayurveda, as well as modern literature, approaches health from two perspectives, first the preventive aspect where the aim is sustaining health in healthy and the second one the curative aspect which aims at the treatment of the manifested diseases. Ayurveda places special emphasis on "Ahara" (diet) and "Anna" (food) as a means to the good life, health, and wellness. Along with the dietary aspect which consists of pathya and apathya, Ayurveda looks into the Prakriti of the participants and lays emphasis on yoga asanas.

Aim: The study aims to look into 3 key aspects - pathya apathya aahar, Prakriti, and yoga asanas between the patients who follow the ayurvedic treatment regimen and those who follow the allopathic treatment regimen

Methodology: A cross-sectional study was conducted in Mumbai among 100 type 2 diabetic participants, among them, 50 were from the allopathic treatment regimes and 50 were from ayurvedic treatment regimes, between 20-60 years of age. Data was collected, in which, information related to general demographic characteristics, questions pertaining to pathya apathya aahar on various food groups, specific Prakriti questions pertaining to Psychological and Physiological aspects, and lastly questions related to various yoga asanas/exercise was included. In addition to this, a 2- day 24hr recall and food frequency questionnaire was filled with the help of a research assistant to get a better picture in terms of pathya and apathya aahar from the participants. Analyses were performed by statistical analysis using SPSS version 25. P<0.05 was considered to be statistically significant.

Results: It was observed from the study that 50+ years of Ayurvedic participants 72% were older in age

(p=0.014) (52.9±7.4).In Prakriti, in terms of appetite, it was noted that n=9 allopathic participants had more irregular, scanty appetites, n=10 participants of allopathic reported slow but steady appetite. In contrast, a strong unbearable appetite was seen more in n=43 ayurvedic participants. p <0.05 (p =0.015 and Chi-square = 8.422).Overall the Prakriti shows a high score for pitta in Ayurveda (p = 0.049). In terms of food, a higher percentage of participants in the allopathic treatment regime never fasted (76%) wherein participants in the ayurvedic treatment regimes (44%) fasted sometimes (p=0.025). Salt intake was seen more in allopathic participants (17%) (p=0.038). Ayurveda participants consumed high sour food 15% as compared to allopathic 7% (p=0.053). The frequency of consumption of chole/ rajma/ urad dal was more in patients who were consuming an allopathic treatment regime (p=0.024). In oil, particularly allopathic participants consumed more (p=0.046) Soybean/safflower oil. All of the above listed showed a statistically significant difference.

Conclusion: No significant difference was noted in the blood glucose levels between participants on ayurvedic and allopathic treatment regimes. The food frequency showed a mixed pattern of pathya and apathya food intake by ayurvedic participants irrespective of the knowledge imparted to them in the course of time during the treatment. Allopathic and ayurvedic participants did follow some pathya food regimes however no major statistically significant difference was noted in the study in terms of pathya and apathya food intake between both the groups. It can be concluded that with the right attitude and practice participants can manage blood glucose on a long-term basis.

Keywords: Type 2 diabetes, Prameha, Prakriti, Pathya aahar, Apathya aahar, Madhumeha, Allopathic, Ayurveda.

Introduction:

Diabetes mellitus (DM) is a metabolic disorder, and it has become an epidemic with about 463 million people (20 to 79 years) affected as per 2019 estimates, representing 9.3% of the total world's population. (Banerjee et al. 2015)

Type 2 diabetes is a metabolic disorder in which there is insulin resistance as the body does not use insulin properly and usually has relative (rather than absolute) insulin deficiency. Ayurveda considers type 2 diabetes as prameha which is passing excessive sweet urine as madhu and turbid in color. (Galav et al. n.d.;2022) If prameha is not treated Madhumeha develops which is characterized by covering excess Kapha over Vata and these obstructed doshas (Pradeepa and Mohan 2021). IDF estimated that the diabetes burden is growing faster in lower and middle income(P Srinivas et al. 2022). Studies suggest that diabetes is strongly associated with increasing urbanization, population growth, aging, patients' unhealthy lifestyle choices, reduced physical activity, obesity, behavioral patterns, socioeconomic changes, and perhaps most importantly a 'Western style' diet (Edavalath 2018). Medical nutrition therapy focuses on reducing weight in case of obesity, the overall distribution of macronutrients is as follows, 50% to 55% carbohydrate, 30% fat (of which no more than 10% should be saturated fatty acids, and 15%–20% protein), as well as fiber. It is important to remember that both portion control in managing diet and Physical activity are crucial for better management. (Nyenwe et al. 2011).

According to Ayurveda, in Prameha, looking at the type of Agni, Prakriti, and maintenance of dosha can help individuals in better management of blood glucose. With respect to Agni, prameha takes place at the Mandagni level of Dhatwagni takes place. Prameha manifests mainly due to the derangement of Dhatwagni. Madhumeha occurs due to the effect of Āma (unassimilated metabolite or autoimmune substances), accumulation in the body (Sivapuram et al. 2021). Ayurveda asserts that although the digestive capacity of each person may be different, the quality and appropriate quantity of food is necessary for a healthy life. (Singh, Singh, and Dhakar 2017). Besides Agni which needs to be analyzed, Prakriti of the patient is also looked into.

Prakriti (Pra = primary, Kriti = creation), or a human being's physiological personality, is an essential Ayurveda construct that explains an individual's biological variability that is distinguishable based upon genetic specificity and epigenetic effects. Accordingly, a person's Prakriti is determined by the dominance of one or more of the three doshas (Vatta, pitta, and Kapha). Dosha is considered a condition in the body

caused by certain substances, and different combinations of its elements interfere with physiological activities. Vata refers to wind, energy, or all movements inside the body; pitta designates bile and its functioning; and Kapha refers to phlegm and other problems in the nose, ear, and throat in modern science, and their balance and imbalance refer to different Ayurveda personalities. (Banerjee et al. 2015). Prakriti is a set of physical, physiological, and psychological attributes that are unique to an individual and can be considered as a phenotypic phenomenon arising from a particular genotype. Human beings are classified into seven Prakriti types, the categorization is done based on certain attributes of the tridosha in their body. (Vaibhavi et al. 2013).

One of the key aspects of lifestyle modification is Yoga, It is a mind-body practice that originated in ancient India and focused on the sequence and combination of different asanas (postures) synergizing with breath and mind control. These asana/postures are not merely practicing physical movements but exert a coordinated positive impact on health and lifestyle. Yoga, through the neuroendocrine mechanism, has been proven to be associated with a decrease in the glycemic status and lipid profile of individuals. It is indicated that exercise, both aerobic and resistance, positively increased insulin sensitivity, improved glycemic level, and decreased cardiovascular risks in diabetic patients. (Banerjee et al. 2015).

Overall management of type 2 diabetes states, that Ayurvedic Pathya Ahara (wholesome diet) and Pathya Vihara (wholesome lifestyle) can play a major role in disease prevention. (Edavalath 2018). Management of diabetes includes -Ahar(diet), Vihar(lifestyle), and Aushadhi(medicine) as the main pillar (Gordon et al. 2019)

Aim:

The study aims to look into 3 key aspects - pathya apathya aahar, Prakriti, and yoga asanas between the patients who follow the ayurvedic treatment regimen and those who follow the allopathic treatment regimen

Methodology:

A cross-sectional study was conducted in Mumbai among 100 type 2 diabetic participants, among them, 50 were from the allopathic treatment regimes and 50 were from ayurvedic treatment regimes, between 20-60 years of age. It was a purposive sampling technique. Participants were asked to scan their blood glucose levels (Random blood glucose/ Fasting blood glucose/ Postprandial blood glucose/HBA1C) to confirm they were being diabetic as well as to further correlate the blood levels with other parameters. The data was collected in a hybrid manner (offline + online) keeping the inclusion and exclusion criteria in mind which consisted of the following:

Inclusion criteria:
➔The age group of 20-60 years
➔Both genders
➔Type 2 Diabetic patients
➔Participants with blood reports availability

Exclusion criteria:
➔GDM (Gestational Diabetes Mellitus)
➔Type 1 Diabetes
➔Psychiatric Illness

A google form was filled out by the research assistant after the participants consent. The form had segments ranging from general information, socio-demographic details, anthropometric measurements, medical history, a list of medicines which the participants were on, type 2 diabetes detection, blood glucose reading, and family history of diabetes to more detailed questions pertaining to pathya apathya aahar on various food groups, specific Prakriti questions pertaining to Psychological and Physiological aspects, and lastly, questions related to various yoga asanas/exercises. In addition to this, a 2- day 24hr recall and food frequency questionnaire was filled with the help of a research assistant to get a better picture in terms of pathya and apathya aahar from the participants. .

The data collected was analyzed by statistical analysis using SPSS version 25. Shapiro Wilk test, Mann Whitney U test, and Fisher's exact test/ chi-square test were used. Spearman correlation was used to analyze the correlation between various parameters. P<0.05 was considered to be statistically significant.

Results:

The key result obtained from the study are noted below, which consists of general information, Prakriti, Yoga, Food frequency and pathya apathya food consumption, macronutreints consumption, and correlation.

Table 1: Basic information of the participants related to age, gender, education, and income status, family history, and time of type 2 detection

Demographic characteristics	**Allopathic participants (n=50)**		**Ayurvedic participants (n=50)**		**Total (n=100)**		**Chi-square**	**P-value**
	N	**%**	**N**	**%**	**N**	**%**		
Age								
<=40	6	12	4	8	10	10	4.299	0.117
41-50	18	36	10	20	28	28		
51+	26	52	36	72	62	62		
Gender								
Males	28	56	24	48	52	52	0.641	0.423
Females	22	44	26	52	48	48		
Education								
Undergraduate	32	64	37	74	69	69	2.829	0.419
Graduate	10	20	10	20	20	20		
Diploma	4	8	1	2	5	5		
Post-graduate	4	8	2	4	6	6		
Income status								
Lower income	7	14	4	8	11	11	4.536	0.338

Lower middle income	18	36	17	34	35	35		
Middle income	23	46	22	44	45	45		
Upper middle income	2	4	4	8	6	6		
Upper income	-	-	3	6	3	3		
Family history of type 2 diabetes								
Yes	25	50	26	52	51	51	0.040	0.841
No	25	50	24	48	49	49		
Type 2 diabetes detected								
6 months	11	22	6	12	17	17	11.901	0.064
1 year	2	4	6	12	8	8		
2 years	3	6	6	12	9	9		
3 years	6	12	-	-	6	6		
4 years	4	8	2	4	6	6		
5 years	4	8	6	12	10	10		
>5years	20	40	24	48	44	44		

In the study (Table1) gives the demographic information of the study participants. 50+ years of Ayurvedic participants were older age 72% and allopathic participants were 52% older. The data showed a statistically significant difference (p=0.014). Allopathic showed (50.1±6.7) and ayurvedic participants showed (52.9±7.4). It was also noted that the majority of participants (62%) belonged to more than 50 years of age. The data shows type 2 diabetes prevalence among middle age. Within the age group of 41-50 years, Allopathic participants were 36% older than the ayurvedic participant group of 20%. However, there was no statistically significant difference noted in the above-stated information.

Out of 100 participants, 52% were males and 48% were females. When education was inquired about, 69% were undergraduates, 20% were graduates, 5% were diplomas and 6% were post-graduates. When reported about the family history it stated that 51% of participants showed a positive family history of type 2 diabetes, wherein 49% of participants declined of family history of type 2 diabetes. There was no statistically significant difference in gender distribution, education of participants, and family history when classified based on the treatment regime (p>0.05). The study participants came from lower-income status which consisted of 11% of participants, and the lowest middle-income group consisted of 35% of participants. The middle-income group consists of a majority of participants 45%. There was no statistically significant difference in the income status of the participants (p>0.05) (p = 0.338), (Chi-square = 4.536).The time at which type 2 diabetes had been detected showed, that within 6 months 17% of participants detected type 2 diabetes, Within 1 year 8% of participants detected it, 2 years 9% of participants, 3 years 6% of participants, 4 years 6% participants, 5 years 10% of participants, and the majority was noted in higher than 5 years which was a total of 44% participants.There was no statistically significant difference in the time at which type 2 diabetes was detected among the participants (p>0.05), (p= 0.064), (Chi-square =11.901)

Table 2: Basic information related to Anthropometric measurements and Blood glucose profile

Anthropometric measurements and blood glucose profile	**Allopathic participants**	**Ayurvedic participants**	**P-value**
Height (cms)	162.1±7.6 (n=50)	159.8±7.5 (n=50)	0.142
Weight (kgs)	70.8±11.3 (n=50)	68.3±10.2 (n=50)	0.172
BMI (kg/m2)	28.3±4.8 (n=50)	28±3.6 (n=50)	0.674
Random blood sugar	273±51.1 (n=3)	183.8±50.3 (n=6)	0.071
Fasting blood sugar (FBS)	160±58.1 (n=45)	143.4±51.9 (n=47)	0.21
Postprandial blood sugar (PBS)	209.5±63 (n=41)	210.1±87.7 (n=44)	0.476
HBA1C	9.1±2.3 (n=18)	8±1.9 (n=10)	0.24

(Table 2) states the demographic information related to BMI, <23 kg/m2 BMI was present in (9%) participants, 23-25 kg/m2 BMI was noted within(9%) participants, however, majority of the participants showed a BMI ranging within 25-30 kg/m2 (48%) and some within the BMI of >30 kg/m2 (26%). The data gives an idea that the majority of the participants were in the preobese to class 1 obese category. There was no statistically significant difference in the BMI when noted among the participants (p>0.05), (p= 0.851), and (Chi-square =1.066)

Few participants noted diabetes with other complications. The blood parameters show that in allopathic Random blood sugar (273±51.1), FBS (160±58.1), and HBA1C (9.1±2.3) seem to be higher, and in ayurvedic PBS (210.1±87.7) noted a higher value.

Table 3: Prakriti and it's relation with age, anthropometric measurements and blood glucose level

Parameters	**Vatta**	**P value**	**Pitta**	**P value**	**Kapha**	**P value**
	Rho value		**Rho value**		**Rho value**	
Age	0.247	0.013*	-0.102	0.312	-2.39*	0.017
Weight	-0.002	0.984	-0.095	0.349	0.062	0.538
BMI	0.01	0.921	0.048	0.639	-0.036	0.724
FBS	0.015	0.884	0.027	0.796	-0.104	0.325
PBS	-0.004	0.971	0.039	0.72	-0.06	0.587
HBA1C	-0.19	0.332	0.041	0.837	0.164	0.404

***P <0.05**

In (table 3) Vatta was significantly positively correlated with age ($p<0.05$), indicating that vatta increased in participants with an increase in age, whereas Kapha was negatively associated which indicates with increasing age there was a decrease in Kapha.

Apart from this, with increasing weight, there was a decrease in vatta, pitta, and increases in Kapha. With an increase in BMI, there was an increase in vatta, and pitta properties but decreased Kapha. Similarly, with an increase in FBS, there was an increase in the level of vatta, and pitta but Kapha decreased, whereas in PBS with it increasing there was a decrease in vatta and Kapha and an increase in pitta. HBA1C shows with it increasing, there was a decrease in vatta however pitta and Kapha property increases. The above stated have no statistically significant correlation ($p>0.05$)

Table 4: Prakriti and its relation with cereal, pulse, fruits, vegetable, milk, and milk products, and non-veg foods.

Specific foods	**Vatta**	**P-value**	**Pitta**	**P-value**	**Kapha**	**P-value**
	Rho value		**Rho value**		**Rho value**	
Old rice	0.230*	0.021	-0.075	0.459	-0.168	0.094

Kulith	-0.11	0.274	0.224*	0.025	-0.073	0.469
Raw banana	-0.112	0.266	-0.021	0.834	0.202*	0.044
Pumpkin	-0.174	0.084	0.271*	0.006	-0.027	0.792
Methi leaves	-0.016	0.874	0.295*	0.003	-0.201*	0.045
Yam	-0.034	0.737	0.235*	0.019	-0.176	0.079
Beetroot,carrot	-0.1	0.322	0.222*	0.027	-0.058	0.569
Watermelon	0.183	0.068	0.056	0.583	-0.218*	0.029
Ghee	0.08	0.431	0.167	0.096	-0.256*	0.01
Milk	-0.271*	0.006	0.340*	0.001	0.034	0.735
Eggs	0.081	0.424	0.213*	0.033	-0.257*	0.01
Chicken	0.003	0.979	0.212*	0.035	-0.145	0.151
Fish	-0.038	0.71	0.262*	0.008	-0.125	0.213
Goat	-0.031	0.763	0.377*	-	-0.300*	0.002

***P <0.05**

With respect to specific foods in (table 4) Old rice, Kulith, and raw banana specifically, it stated that with increasing its intake there was an increase in vatta, pitta, and Kapha. There was a significantly positive correlation ($p<0.05$). Also, the table stated that Pumpkin, Methi leaves, Yam and Beetroot, and carrot increases pitta with increasing intake. Here also there was a significantly positive correlation ($p<0.05$). Specific to methi leaves it stated Kapha was negatively associated which indicates with an increasing intake there was a decrease in Kapha. Watermelon and ghee also stated Kapha was negatively associated which indicates with an increasing intake there was a decrease in Kapha. Milk was seen to have a negative association with respect to vatta and a positive correlation ($p<0.05$) with respect to pitta, which means that with increasing intake there would be a decrease in vatta properties and an increase in pitta properties. Chicken and fish consumption was related to a significantly positive correlation ($p<0.05$) which means with increased intake there was an increase in pitta property. Eggs and goat consumption was seen to have a significantly positive correlation ($p<0.05$) with pitta and negatively associated with Kapha, it stated that with increased intake there was an increase in pitta property and Kapha property decreases significantly.

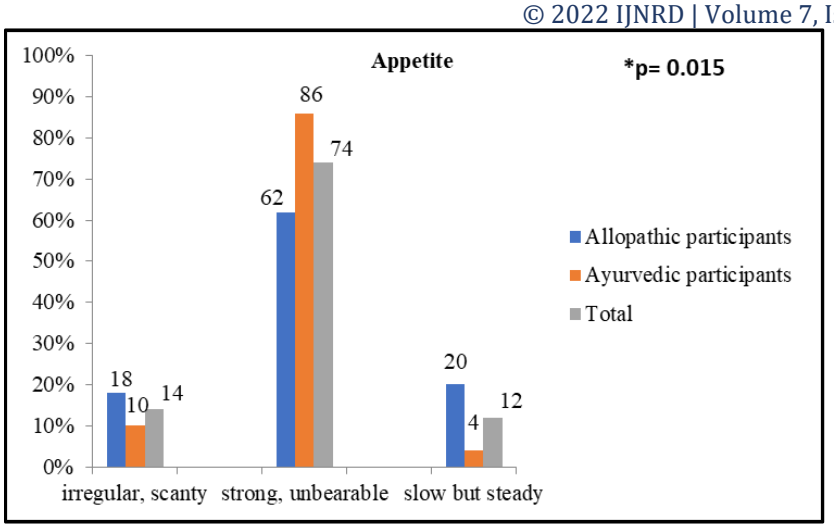

Figure 1: Appetite among the diabetic participants

Data presented as Percentage

(*p <0.05)

(Figure 1) Depits overall appetite, 14% reported irregular scanty appetite, 74% reported strong/unbearable wherein 12% reported slow but steady appetite.
In the study it was seen that n=9 allopathic participants had more irregular, scanty appetite, n=10 participants of allopathic reported slow but steady appetite. In contrast, a strong unbearable appetite was seen more in n=43 ayurvedic participants.
There was a statistically significant difference of p <0.05 (p =0.015 and Chi-square = 8.422)

Table 5: Prakriti score among allopathic and ayurvedic participants.

Prakriti types	**Allopathic participants (n=50)**	**Ayurvedic participants (n=50)**	**P-value**
Vatta	5.7±2.3	5.5±2.0	0.722
Pitta	4.8±1.7	5.4±1.3	0.049*
Kapha	4.6±1.76	4.1±1.7	0.316

(*p <0.05)

In the (table 5) it was seen that Vatta and Kapha are more prevalent among allopathic participants compared to ayurvedic participants. However a statistically significant difference was noted in pitta (p<0.05), Ayurvedic participants noted higher pitta score as compared to allopathic participants

In terms of yoga in this article it was stated that 24% of allopathic and 34% of ayurvedic performed physical activity. Participants who performed yoga asanas practiced in the morning (63.4%) and in the evening (29.6 %). Mostly the participants practiced for <30 mins in 28.2% to 1hr in 29.6%. Frequency ranged from everyday 66.2% to 5 times/week at 22.5%. Ayurvedic participants specifically practiced for 30mins-1hr in 30% of participants, less than 30 mins, 45 mins, and >1hr were practiced among allopathic participants which

account for 34.2%, 15.8%, and 7.9%. The majority of kriyas, asanas, breathing exercises, and walking were performed more by ayurvedic participants compared to allopathic. Thereby ayurvedic participants seem to have better blood glucose management (38%) as compared to allopathic which had (30%)

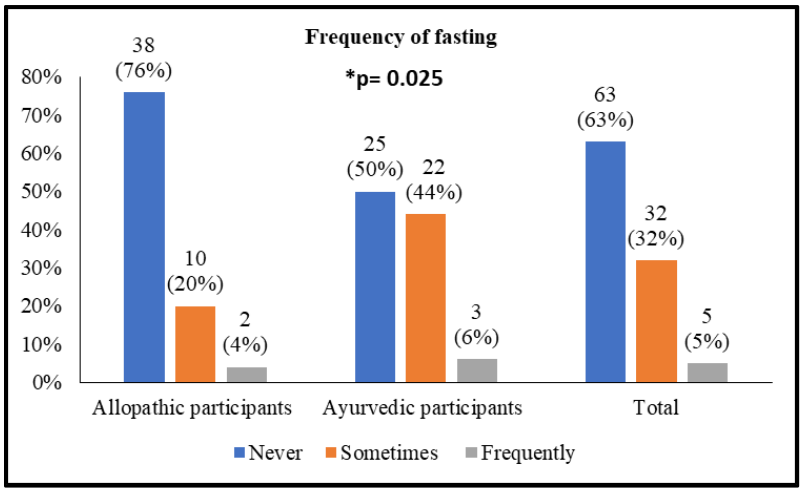

Figure 2: Frequency of fasting

Data presented as Frequency (percentage)

(*p <0.05)

(Figure 2) Out of 100 participants, 63% never fasted, 32% fasted sometimes and 5% fasted frequently. There was a statistically significant difference in the frequency of fasting between those who were on an allopathic treatment regime and those who were on an ayurvedic treatment regime ($\chi 2 = 7.383$, $p=0.025$). A higher percentage of participants in the allopathic treatment regimes never fasted as compared to those in the ayurvedic treatment regime. On the other hand, a higher percentage of participants in the ayurvedic treatment regimes fasted sometimes as compared to those in the allopathic treatment regimes.

Other components of the study stated:

Salt intake was more in allopathic participants (17%) as compared to Ayurveda participants (8%). There was a statistically significant difference.

In the frequency of sour food consumption among those who were on an allopathic treatment regime and those who were on an ayurvedic treatment regime. Ayurveda consumed high sour food 15% as compared to allopathic 7%. There was a statistically significant difference.

In terms of various food group consumption between both groups, pulses and oil consumption showed a statistically significant difference between both groups, the rest all proved to be non-significant:

In cereal consumption, barley consumption was seen high among ayurvedic participants (1.4±1.4).

In pulses, Green Gram dal consumption was seen high among ayurvedic participants (8.3±1.9. The frequency of consumption of chole/ rajma/ urad dal was more in patients who were consuming an allopathic treatment regime (2.9±1.3) as compared to those who were on an ayurvedic treatment regime (2.4±1.1). There was a significant statistical difference.

Except for drumsticks, the vegetable intake among ayurvedic participants was high in consumption compared to allopathic participants.

Except for potatoes, intake of other tubers was high in ayurvedic participants.

Fruits and oil consumption in ayurvedic participants consist of pathya and apathya both. However, in oil allopathic participants consumed more (8±2.6) Soybean/safflower oil as compared to ayurvedic participants(6.6±3.6) and showed a statistically significant difference.

In milk and milk products, Ayurveda participants consumed all foods in higher amounts as compared to allopathic participants.

Ayurvedic participants consumed all sweetening agents in higher amounts compared to allopathic participants.

Except for goat meat all the non-veg products were consumed in lesser amounts by the ayurvedic participants as compared to allopathic participants.

Except for wine which was consumed in higher amounts by ayurvedic participants, the rest of the drinks products were consumed in lesser amounts.

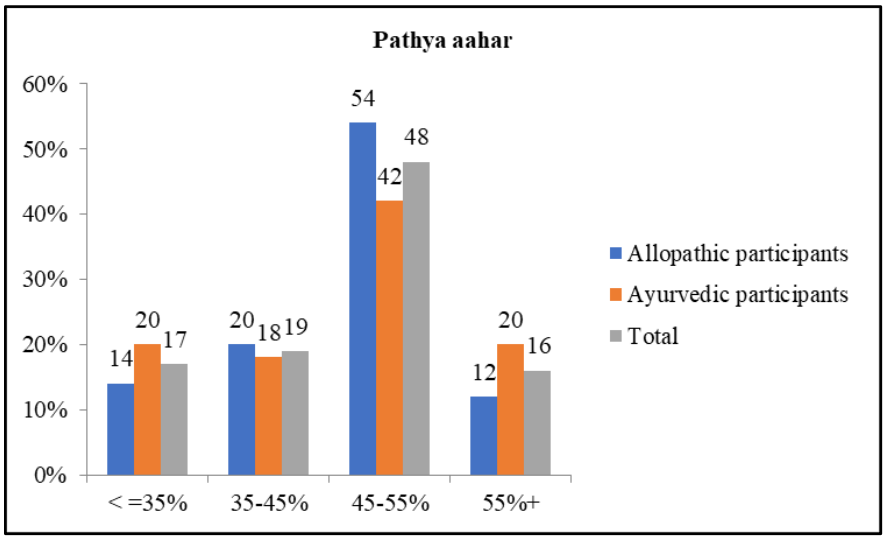

Figure 3: Distribution of Pathya aahar among allopathic and ayurvedic participants

Data presented as Frequency (percentage)

In the figure (3) 20% of ayurvedic participants were followed up to 35% of pathya rules. 20% and 54% of allopathic participants were following up to 35-45% and 45-55% of pathya rules. However, it was noted that 20% of ayurvedic participants followed up to 55% of pathya rules. There was no statistically significant difference which was noted between allopathic and ayurvedic participants. (p >0.05)

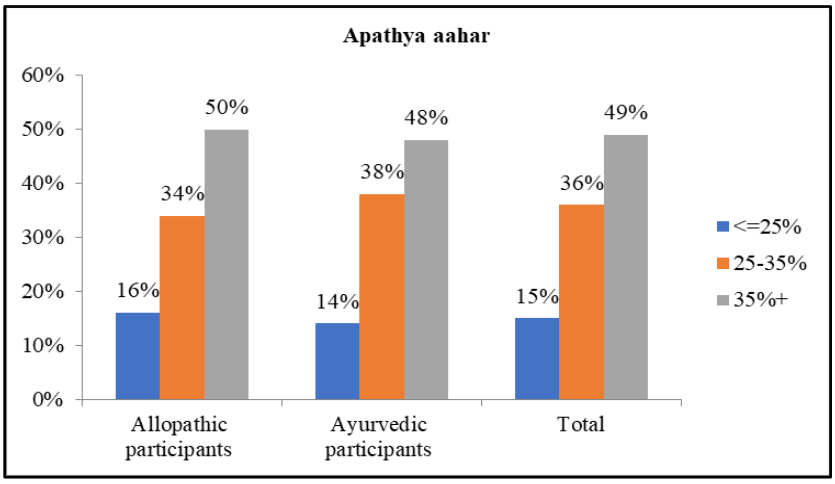

Figure 4: Distribution of Apathya aahar among allopathic and ayurvedic participants

Data presented as Frequency (percentage)

In (figure 4) it was noted that the consumption of apathya aahar was similar among both groups. The ayurvedic group consumed about 38% whereas the allopathic group consumed 34%There was no statistically significant difference which was noted among allopathic and ayurvedic participants. (p >0.05)

Table 6: Blood glucose relation with specific food intake

Parameters	**FBS**	**P-value**	**PBS**	**P-value**	**HBA1C**	**P-value**
	Rho value		**Rho value**		**Rho value**	
Bajra,jowar,ragi	0.219	0.036*	0.187	0.087	0.084	0.672
Moong dal	0.156	0.136	0.223*	0.04	0.023	0.908
Cabbage	-0.178	0.09	-0.249*	0.022	-0.125	0.525
Coconut oil	-0.169	0.107	-0.242*	0.026	0.042	0.831

(*p <0.05)

In (Table 6) When stated about food, Bajra, jowar, ragi, and Moong dal were seen to have a significantly positively correlated (p<0.05), with increasing intake, there was an increase in FBS and PBS respectively. Cabbage and coconut oil was known to have a negative correlation and it stated that with increased intake there was a decrease in PBS.

In macronutrient distribution, carbohydrate (250.6±78.8) and fiber (43.9±17.7) consumption was seen more in ayurvedic participants compared to allopathic participants. Differences in the distribution of EAR and RDA macronutrients also showed fiber intake to be higher in ayurvedic participants (146.4±59.1). The percentage distribution of Energy from macronutrients did show carbohydrate consumption higher (50.6±55.6) in the ayurvedic participant group. However, none of the above stated showed a statistically significant difference (p >0.05)

Discussion:

In terms of basic information, it was noted that no significant difference in the gender differentiation in type 2 diabetic participants was seen. In terms of education, one of the reasons that the participants belong to the lower-income group could be their education status which depicts the majority being undergraduates from both groups. With respect to the family history of type 2 diabetes which was prevalent, proper lifestyle modification with an exercise regime could have been helpful in preventing or managing type 2 diabetes.

One research article stated information related to gender differentiation that the International Diabetes Federation indicates sex differences in worldwide diabetes prevalence in adult populations (9.1% in men vs 8.4% in women), suggesting that about 12.3 million more men than women worldwide were living with diabetes in 2017 (Tramunt et al. 2020). According to WHO, the prevalence of diabetes is growing most rapidly in low- and middle-income countries (Pradeepa and Mohan 2021). The National Center for Health

Statistics reported that socioeconomic status plays an important role in the development of T2DM, where it was known as a disease of the rich. On the contrary, the same reference reported that T2DM was more prevalent in lower-income levels and in those with less education. The differences may be due to the type of food consumed (Sami et al. 2017). In resource-poor settings, when type2 diabetes is diagnosed, often the patient leaves the clinic with a list of new medications and little else. There is wide variation in the use of dietary modification (Forouhi et al. 2018).In terms of income and education status, this study does support similar findings to the above-listed study.

In terms of age which are shown in the study, states participants are older in the age which is 50+. Similar literature states the age group most affected by diabetes was 61-65 years.(Debrah Asiimwe .et.al. 2022)

BMI in the study showed participants being preobese to obese, however, no statistically significant difference was noted. Literature shows obesity is seen to cause insulin resistance and further complications thereby resulting in a poor prognosis in the management of blood glucose. In obese individuals, the amount of nonesterified fatty acids, glycerol, hormones, cytokines, pro-inflammatory markers, and other substances that are involved in the development of insulin resistance, is increased. The pathogenesis in the development of diabetes is based on the fact that the β-islet cells of the pancreas are impaired, causing a lack of control of blood glucose. (Al-Goblan, Al-Alfi, and Khan 2014). An adipocyte hormone resistin is seen to provide a link between obesity and diabetes. (Sithara and Yaligar n.d., 2015)

In the study, there were seen fluctuations in appetite of the participants. Literature states, in-state where there is irregular, scanty appetite, and strong unbearable appetite research states it as uncontrolled diabetes where blood glucose levels remain abnormally high (hyperglycemia), glucose from the blood cannot enter the cells – due to either a lack of insulin or insulin resistance – so the body can't convert the food you eat into energy. This lack of energy causes an increase in hunger. (Anon. n.d,2022)

The study showed participants in both allopathic and ayurvedic treatment were fasting.However, both modern and ayurvedic literature suggest individuals presenting with diabetes should not be fasting. Modern literature states that fasting food consists mainly of starchy food which is high in glycemic index thereby causing hyperglycemia whereas individuals who do not consume anything can go under hypoglycemia on a long-term basis. Glycogenolysis (breakdown of glycogen to glucose) takes place in the body in both normal and diabetic individuals however in normal individuals it is controlled by insulin in diabetic individuals there is insulin resistance thereby glucose level increases in the body with respect to the intake of starchy food. It is essential to consume a proper meal at a given time to help manage blood glucose better.

The study reported excess consumption of salty and sour food, which are considered as apathya according to ayurvedic literature. Excessive salt consumption is linked to hypertension according to modern literature. Ayurveda considers it apathya as it vitiates Kapha and pitta and also the transformation of the taste of salt after the digestion changes to sweet thereby vitiating the disease condition and affecting the dosha. (Ayurvedic science of food and nutrition). Ayurveda states sour foods increase Kapha and pitta and thereby should be avoided in diabetic participants. (Ayurvedic science of food and nutrition)

The study showed a statistically significant difference in terms of pulses and oil consumption.
Ayurveda considers the consumption of chole/ rajma/ urad dal and Soybean/safflower as apathya. Hence its intake is advised to be as minimalistic as possible.
Literature supports Whole green gram and Bengal gram have more fiber content (4 g) than green gram dal and Bengal gram dal (1 g). Whole horse gram and Toor dal also have rich fiber content (5 g) thereby the

intake is advisable and is considered pathya (Sharma and Prajapati 2014). Modern literature supports consuming cereal pulse combinations which will lower the glycemic index of the meal.
Literature also states consumption of PUFA-rich oil like Soybean/safflower can aggravate the risk of obesity thereby and considered apthya. The use of traditional oil like groundnut/sesame/mustard and even soybean oils or blends of oils seems to be a better option as it could ensure an optimal ratio of saturated, monounsaturated, omega-3, and omega-6 fatty acids and reduce the risk of metabolic problems, a pre-event that leads to diabetes and cardiovascular disorders and hence considered pathya. (Ayurvedic science of food and nutrition)

Palm oil specifically is shown to increase the risk of Cardiovascular problems according to modern literature. Literature shows that the import and consumption of palm oil, often incorporated in the popular oil vanaspati (partially hydrogenated vegetable oil, high in trans fats), is high. Moreover, the traditional Indian cooking practice of frying at high temperatures and re-heating increases trans fatty acids in oils. Such oils are low cost, readily available, and have a long shelf life, and thus are more attractive to people from the middle and low socioeconomic strata but their long-term effects on type 2 diabetes are unknown. (Forouhi et al. 2018)
Modern literature suggests giving blends of oils instead of one specific oil. However, mustard oil is good for omega-3 and coconut oil is good for cognition in older people. However, coconut oil which is a good source of SFA is advised to consume in limited amounts. Trans fat is strictly avoided.

Conclusion:

In the study it was seen that Diabetes irrespective of the diabetic treatment, management of blood glucose level plays a very important role. No major difference was noted in blood glucose levels between participants on ayurvedic and allopathic treatment regimes. The food frequency showed a mixed pattern of pathya and apathya food intake by ayurvedic participants irrespective of the knowledge imparted to them in the course of time during treatment. Allopathic and ayurvedic participants did follow some pathya food regimes however no major statistically significant difference was noted in this study in terms of pathya and apathya food intake between both the groups.
It can be concluded that the attitude of the participants in the way they look at food if changed with suitable sustainable modifications can help the participants follow the regime on a long-term basis. Along with that, lifestyle modification in terms of better stress management, and indulgence in physical activity would be helpful in combination with special consideration for the food that is apathya - pathya aahar.

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