Knowledge, Attitude And Practice Of Diabetic Patients Regarding The Use Of Artificial Sweetners As Substitute To Sugar

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Abstracts: Background: Artificial sweeteners have both beneficial effects and unwanted adverse effects on health as stated by several studies. Inspite of their beneficial effects in diabetes,long term use of artificial sweeteners are not recommended because of their health related complications like obesity, metabolic disorders and Type 2 diabetes etc.Therefore before consuming any artificial sweetener,all diabetic patients should be aware of both health benefits and their health hazards. SO,current study is planned to know the level of knowledge, attitude and practice of diabetic patients regarding artificial sweeteners and to create awareness among these patients to prevent health related complications on long term use of artificial sweeteners. Methodology: A total of 536 diabetic patients were interviewed in the hospital for a period of 3 months. Out of them, 205 diabetic patients were enlisted for the study as they were consuming artificial sweeteners as a substitute to sugar and data was collected through semi structured questionnaire prepared to sought information on knowledge, attitude and practice of diabetes patients on artificial sweeteners and their use. Results: Analysis of knowledge of patients showed that 97% patients don't know the content of artificial sweetener they consume , 78.5% patients are unaware of health benefits and health hazards of artificial sweeteners and 99.5% patients don't know for how long these products should be consumed. Analysis of attitude of patients showed that 68.7% patients thinks that they would not prefer to use normal sugar instead of artificial sweetener,94.6% patients thinks that all artificial sweeteners are tested and approved to control blood sugar level . Analysis of practice of patients showed that 80% patients use artificial sweetener in the tablet form specially in tea and only 16% patients felt feeling of well being after consuming artificial sweeteners but rest of the patients are consuming these products only because of doctors advice. These respondants are consuming artificial sweeteners for mean duration of 5.4±4.5 yrs. Conclusion: Maximum no of well educated type 2 diabetes patients prefer to use artificial sweeteners in their diet to control blood sugar level without complete awareness on the content & proper consumption of sweeteners, different types of sugar substitutes, health benefits and hazards of sweeteners. Hence, there is a dire need to promote awareness about artificial sweeteners among diabetic patients in order to prevent any long term complications related to the consumption of these sweeteners.[Jain R Natl J Integr Res Med, 2018; 9(6):28-35]

Key Words: artificial sweeteners, diabetes mellitus, KAP study

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Introduction: There has been a well appreciated and discernible rise in awareness among the general population about their health, figure and fitness, due to which they are rather abstaining from consumption of all forms of sugar, salt or fat [1, 2]. With an exponentially rising preoccupation of the consumers with reducing sugar intake, calorie free artificial sweeteners have become widely popular [3, 4].

Artificial sweeteners (AS) or Non nutritive sweeteners (NNS) are food additives that mimic the effect of sugar in taste with less or no calories. Food Safety and Standards Authority of India (FSSAI) has approved 5 artificial sweeteners viz. Saccharin sodium, Aspartame, Acesulfame potassium, Sucralose and Neotame. They are generally several hundred to several thousand times sweeter than sucrose [5]. Most of them do not contain any calories while some artificial sweeteners (e.g. aspartame) contain very few [6]. Each sweetener has specific characteristics of sweetness intensity, persistence of the sweet taste, coating of the teeth and aftertaste effect [7, 8]. Consumers often select those edibles, which are composed of low calorie sweetener as they want the taste of sweetness without added calories. The dietary option that such products provide may be especially supportive in the management of non communicable diseases like obesity, diabetes mellitus, cardiac disorders or stroke.

Diabetes is fast gaining the status of a potential epidemic in India with more than 62 million diabetic individuals currently diagnosed with the disease.[9,10] According to Wild et al [11], the prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030, with a maximum increase in India. Today,

for diabetes management, regulation of blood glucose is essential. As people are impeded by their means to control blood glucose level due to sedentary lifestyle and rising urbanization, they are restraining their sugar intake by substituting it with artificial sweeteners. Some sugar substitutes do release energy, however as they are slowly metabolized in the body, blood sugar levels remain relatively stable over longer duration [12].

Artificial sweeteners have both beneficial effects and unwanted adverse effects on health as stated by several studies. A number of studies review the safety of artificial sweeteners. Few studies have demonstrated positive effect on health following NNS consumption. A study among diabetics showed intake of sugar-sweetened beverages was significantly associated with increased risk of type-2 diabetes, whereas this was not the case for intake of artificial sweetened beverages, thereby showing the beneficial effects of artificial sweeteners [13]. Some other studies have noted adverse effects on health due to NNS consumption. One such analysis of several epidemiological studies, Metabolic Effects of NNS, concludes that consumption of NNS, mainly in diet sodas is associated with increased risk to develop obesity, metabolic disorders and Type 2 diabetes.[14]A cross sectional survey by National Health and Nutrition Examination Survey (NHANES) showed that consumption of added sugars among US adolescents is positively associated with increase cardiovascular disease risk.[15]Based on the report of beneficial effects and health hazardous effects of artificial sweeteners obtained by many study, An observational study was conducted to assess the level of knowledge of individuals with diabetes mellitus treated at the Outpatient Care Center (OCC) located in Carapina, a municipality of Serra, ES, Brazil. This study showed that, respondents have little knowledge about DM, as well as on the proper consumption of sweeteners and the types of sugar substitutes [16]. Many more investigative studies have been conducted on the artificial sweeteners with conclusions ranging from “safe under all conditions” to “unsafe at any dose”. Hence, the scientists are polarized in their views on the issue of safety of artificial sweeteners. In scientific as well as in lay publications, supporting studies are often widely referred while the studies with opposing results have been de-emphasized or dismissed (NCBI Reference). Thereby, there is a need to raise awareness among the diabetic patients regarding the health controversy over proclaimed benefits of sugar substitutes.

Proper management by medications, diet and exercise may prevent the complications. All artificial sweeteners have been approved by the U.S. Food and Drug Administration (FDA). The FDA made this decision after looking at tests which show that "normal use" of artificial sweeteners would not cause health problems. However, these tests did not show how safe artificial sweeteners would be when consumed over a lifetime. As a result, in spite of their beneficial effects, long term use of artificial sweeteners is not recommended due to their health related complications. Therefore, before using any artificial sweetener, diabetic patients should be made aware of its health benefits and hazards.

Hence, considering the importance of these products in the regulation of the disease, this study is planned to assess the level of knowledge, attitude and practice (KAP) of diabetic patients regarding artificial sweeteners. KAP studies are fairly well measurable and interpretable studies that they have a simpler methodology of conduction. Thereby, such studies are an example of a vital research modality that provides an insight into a patient’s approach during clinical trials. This study also aims to create awareness among diabetic population in order to prevent health complications produced by long term use of these products .

Material and Methods: This was a cross sectional study conducted on diabetic patients attending the Medicine OPD of KLES Dr. Prabhakar Kore Charitable Hospital, Belagavi between june 2018 to september 2018.Total 536 diabetic patients were interviewed and out of them 205 patients found to consume artificial sweeteners in their diet.These 205 patients were recruited for the study and from whom data was collected.Before the beginning of the study, ethical approval was obtained from the institutional ethics committee and written informed consent was obtained from patients who participated in the study.

The instrument used for data collection was a semi-structured questionnaire, with closed and open ended questions, consisting of four parts: the first being the socio demographic data; the

second ,data related to assess knowledge of diabetes patients on artificial sweetener; the third, data related to assess attitude of diabetes patients on artificial sweetener and finally, data related to assess practice of diabetes patients on artificial sweetener use .Total 24 questions were prepared and administered to the diabetic respondents in order to achieve the purpose of the study. Their autonomy, confidentiality and anonymity was maintained. They had complete liberty of not responding to any of the questions and quit at any time during the study.

By taking proportion of knowledge of aforementioned topic among the patients as 50%, sample is calculated using the formula: $n=4pq/d^2$
n- Sample size
p- Prevalence of non adherence =50[(2)]
q- (100-p)
d- Relative precision=20% of p i.e. 10
Total sample (n) = 203(205)

Inclusion criteria: Diabetic patients who used artificial sweeteners as substitute to normal sugar were included.
Exclusion Criteria: Diabetic patients who were not using artificial sweeteners and also those who were not able to perceive the questions were excluded.
Analysis: Qualitative data was analyzed using descriptive statistical parameters. Data has been presented in the form of percentage and proportions.

Result: Out of 205 diabetic patients who were using artificial sweeteners, 149(73%) patients were male and 56(27%) patients were female in the mean age group of 55.68±9.86 years. The table also indicates that 99.5% of respondents were type II diabetic patients and only one patient was diagnosed with type I diabetes. Out of them, it was interesting to observe that consumption of artificial sweeteners was recorded to be significantly more (63%) in degree holding patients (Table 1)

Table 1: Demographic characteristics of diabetic patients who consumed artificial sweeteners as a substitute to sugar

Demographic profile	Frequency and Percentage
Age groups	
40-49yrs	70 (34%)
50-59yrs	55(27%)
60-69yrs	60(29%)
≥70yrs	20(10%)
Gender	
Male	149(73%)
Female	56(27%)
Education status	
Illiterates	2(1%)
Primary	16(8%)
Secondary	22(11%)
Higher secondary	18(9%)
Degree	129(63%)
Postgraduates	15(7%)
Others	3(2%)
Marital status	
Married	197(96%)
Unmarried	1(0.5%)
Widow	7(3%)
Religion	
Hindu	193(94%)
Non-Hindu	12(6%)
Diagnosis	
Type I Diabetes	1(0.5)%
Type II Diabetes	204(99.5%)

98% patients started using artificial sweeteners only after being diagnosed with Diabetes Mellitus. It was fascinating to note that 56% patients were prescribed with artificial sweeteners by doctors. Despite that, it was intriguing to note only 21% patients were aware of health hazards/benefits of artificial sweeteners.(Table 2)

Table 2: Assessment of Knowledge of the diabetic patients on artificial sweeteners and its use

S.No.	Knowledge Item	Sample Number	%
1.	Through which source you were informed about the artificial sweeteners?		
	Doctor	115	56.1%
	Family/Friends	66	32.2%
	Media	22	10.7%
	Any other	2	1%
2.	Do you know the contents of the artificial sweetener that you are using?		
	Yes	6	2.9%
	No	199	97.1%
3.	Do you know there are varieties of artificial sweeteners available in the market?		
	Yes	54	26.3%

	No	151	73.7%
4.	When did you start using artificial sweeteners?		
	Before diagnosing diabetes	3	1.5%
	After diagnosing diabetes	202	98.5%
5.	Are you aware of the health hazards/benefits of artificial sweeteners?		
	Yes	44	21.5%
	No	161	78.5%
6.	What is the source of your awareness about health benefits and hazards of artificial sweetener?		
	Own experience	15	34.1%
	By Doctor	16	36.4%
	By Friends/ Family	11	25%
	Media	2	4.5%
7.	Why do you use artificial sweetener instead of normal sugar		
	To Control sugar level	81	39.5%
	To Reduce weight gain	4	1.9%
	To Reduce calorie intake	3	1.5%
	All the above reasons	117	57.1%
8.	Do you know the quantity of artificial sweetener that should be taken per serving?		
	Yes	152	74.2%
	No	53	25.8%
9.	Do you know for how long artificial sweeteners can be used?		
	Yes	1	0.5%
	No	204	99.5%

All 205 respondents are of the opinion that diabetes is controlled by combination of medication, exercise and diet. Even then, 70% of patients thinks that artificial sweeteners are better alternative than any other means to regulate diabetes.95% patients believed that artificial sweeteners are tested and approved for regulating blood sugar level in diabetes thereby it was interesting to note that 69% patients didn't want to use normal sugar instead of artificial sweeteners. It is riveting to observe that 70.2% patients use artificial sweeteners in view of their requirement and not because of media influence or their general popularity among the masses. (Table 3)

Graph no 1: Assessment of knowledge on artificial sweeteners

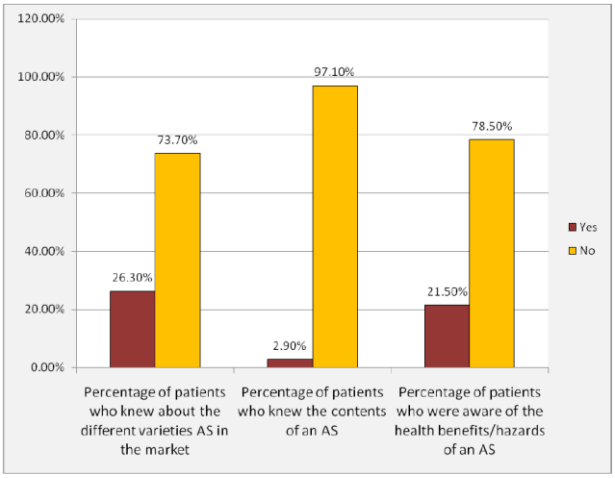


Table 3: Assessment of attitude of the diabetic patients on artificial sweeteners and its use

S.No.	Attitude Items	Sample Number	%
1.	Do you think artificial sweeteners are tested and approved for use to regulate blood glucose level in diabetes?		
	Yes	194	94.6%
	No	11	5.4%
2.	If given a choice would you use normal sugar over artificial sweeteners?		
	Yes	64	31.2%
	No	141	68.8%
3.	Are you using an artificial sweetener only because it is nowadays popular among people?		
	Yes	61	29.8%
	No	144	70.2%
4.	How do you think, Diabetes is better controlled by?		
	Medications	0	0.0%
	Exercise	0	0.0%
	Diet	0	0.0%
	All above	205	100.0%
5.	Are you of the opinion that the use of artificial sweeteners is a better alternative than any other means to regulate diabetes?		
	Yes	63	30.7%
	No	142	69.3%
6.	Do you use a sweetener due to brand loyalty?		
	Yes	1	0.5%
	No	204	99.5%

It can be inferred that all 205 patients were on anti-diabetic medications i.e. 46% patients were on oral hypoglycemic drugs (OHD), 30.2% patients were on insulin and 23.9% patients were on both OHD & insulin. Among these diabetic patients, a whopping proportion of them were taking artificial sweeteners in the form of tablets (80%)-about one to two tablets per serving mostly in tea/milk/coffee. From the table we can observe that these patients had been taking artificial sweeteners for a mean period of 5.4±4.5

years. However, only 16% of these patients noted the feeling of energetic and a general sense of well being as a positive effect of artificial sweetener.(Table 4)

Graph no 2: Assessment of attitude of diabetics on artificial sweeteners

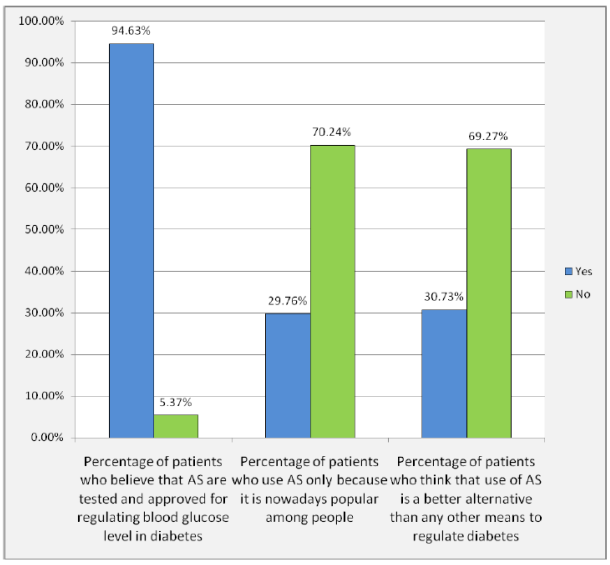
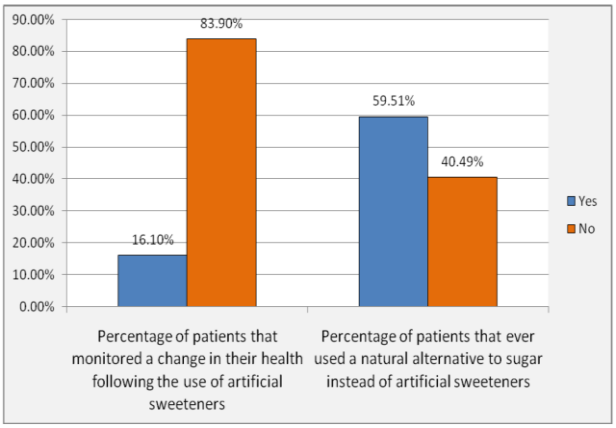


Table 4: Assessment of practice of the diabetic patients on use of artificial sweeteners

SL No	Practice Item	Sample Number	%
1.	Do you take medications for diabetes?		
	Yes	205	100%
	No	0	0%
2.	Which medications are you taking?		
	Tablets	94	45.9%
	Insulin injection	62	30.2%
	Both	49	23.9%
3.	Which form of artificial sweetener do you use?		
	Tablet	164	80.0%
	Powder	32	15.6%
	Liquid	9	4.4%
4.	In which food items do you commonly use artificial sweeteners?		
	Milk only	10	4.9%
	Tea/Milk/Coffee(or at least 2)	184	89.7%
	Sweets only	11	5.4%
5.	How much quantity of artificial sweeteners do you use per serving?		
	Tablets (1-2 tablet per serving)	162	79.0%
	Powder (1/2 to 1 tea spoon per serving)	34	16.6%
	Liquid (one drop per serving)	9	4.4%
6.	Who buys the artificial sweetener for you?		
	Myself	42	20.5%
	Family member	163	79.5%
7.	If yes for family member, are they aware of health benefits and hazards of artificial sweeteners?		
	Yes	20	12.3%
	No	45	27.6%
	Don't know	98	60.1%
8.	Since how long have you been using artificial sweeteners?	Mean	SD
		5.47 years	4.55 years
9.	Did they monitor any change in their health following the use of artificial sweeteners?		
	Yes	33	16.1%
	No	172	83.9%
10	Did you ever change the brand of artificial sweeteners?		
	Yes	3	1.5%
	No	202	98.5%
11	Did you ever use any natural alternative to sugar instead of artificial sweeteners?		
	Yes	122	59.5%
	No	83	40.5%
12	Have you stopped using artificial sweeteners?		
	Yes	14	6.8%
	No	191	93.2%

Graph no 3: Assessment of practice of diabetics on artificial sweeteners



Discussion: Diabetes mellitus ,obesity and the upgrading of health awareness all have participated in the increased rates of nonnutritive sweeteners consumption as they provide a sweet taste without affecting blood sugar level thus are crucial for dieting. Such sweeteners have been part of the life-style modification in diabetics especially meticulous diet regimen which is necessary for weight

reduction and hence HbA1c level decrease that play an important role in minimizing diabetes mellitus complications.Artificial sweeteners have been widely used all over the world not only solely but also had been combined in many types of food giving them the sweet taste without calories like diet beverages. [17]

The present hospital based cross sectional study was conducted to assess the knowledge, attitude and practice of diabetic patients on artificial sweeteners in order to know their dietary habits regarding sweeteners and educate them about these benefits and health hazards of these products .

A total of 536 diabetic patients were interviewed in the hospital for a period of 3 months. Out of them, 205 diabetic patients were enlisted for the study as they were consuming artificial sweeteners as a substitute to sugar. It was duly noted that 99.5% of them were type II diabetic patients, in a mean age group of 55.7±9.8 years and majority of them were males (72.7%) who were married & degree holders (63%). Thereby, this study distinctly indicates that highly educated individuals comprise the majority of people involved in consumption of artificial sweeteners. All 205 patients were on medications viz. Oral Hypoglycemic drugs (46%), Insulin (30.2%) or on both drugs (24%).

Following the analysis of data, it can be stated that 56% patients got the knowledge about probable importance of artificial sweeteners in control of blood glucose levels by doctors. Hence, it was not confounding to assess that 98% patients started using artificial sweeteners only after being diagnosed with the disease. A significant proportion of patients chose artificial sweeteners to control blood sugar level, however quite a few consumed these sugars under the belief that it prevents weight gain and to restrict calorie intake. It is imperative to note that following data assessment, the sweetener most consumed by the population evaluated was identified by its brand name (Sugar Free Natura) and a staggering (97%) of patients did not know about its composition. It was flabbergasting to note that despite following doctors' advice, a colossal number of patients (73%) were unaware of any alternative varieties of artificial sweeteners available in the market. It is experimentally known that each sweetener has its own particularity, such as the limited use of aspartame at high temperatures and the prohibited use of sodium cyclamate by hypertensive individuals as it contains sodium. These examples testify to the importance of identifying the composition of the product [16]. Many studies and surveys have shown that long term use of artificial sweetener can cause health hazards like obesity, diabetes mellitus, cancer etc. [15, 16]. Another crucial observation to be highlighted is that a meager 21% of patients knew about health hazards or even benefits, that too predominantly by doctors (37%) despite all of them being registered patients. Thereby due to lack of knowledge as a consumer and blind trust, not even a single patient knew as to how long such a sweetener can be consumed.

Following assessment of knowledge, the attitude of the respondents regarding the disease, its management and the role of artificial sweeteners were analyzed. It has been experimentally confirmed that physical inactivity and improper diet can contribute to type II diabetes mellitus and thereby diet modifications with or without medications is essential to control the disease [18]. In compliance with this research, it was not startling to note that all 205 patients believed that diabetes is better controlled by all three i.e. medications, exercise & diet. Even then, it was interesting to observe that 95% patients believed that artificial sweeteners are tested and approved for use in controlling sugar level in diabetes. However, it was quite compelling to observe that nearly 30% patients continue to use artificial sweeteners just because of its rising popularity among general masses and media influence. An analysis of these responses highlight that not as many people truly use AS for it benefits as they believe. A thought-provoking observation was noted wherein a significant proportion of patients (69%) would still not prefer to use normal sugar as a substitute to artificial sweetener as they believe it controls blood sugar level and provides a taste similar to that of table sugar. An assessment of attitude of patients thereby emphasizes their belief that artificial sweeteners are a better alternative to sugar in maintaining a better blood sugar level.

Practice of respondents regarding artificial sweeteners was assessed by asking questions based on duration of intake, dosage form, dose and any change in health monitored after taking artificial sweeteners. Our study showed that these 205 diabetic patients used artificial sweeteners for a mean period of 5.5±4.5 years. It

was also found that maximum patients (80%) preferred artificial sweeteners in the form of tablet especially in beverages like Tea, Milk and Coffee (90%), 1 or 2 tablets per serving (79%).

Due to lack of awareness of different forms of artificial sweeteners liquid form is the least preferred despite being an easy dissolvable form. A key response observed in our research was that though 84% of the patients did not find any change in the health following the use of artificial sweeteners nearly 16% patients felt a change in their health following their use described as a general sense of well being. An interesting point was noted that artificial sweeteners were purchased by family members of the patient in (80%) of the cases and. It was noted that either their family members were not aware of consequences of long term usage of artificial sweeteners (27%) or the patient doesn't know whether their family members have proper knowledge about the artificial sweeteners (60%).

Contrary to the belief of the patients that artificial sweeteners are good for their health, 7% patients stopped taking artificial sweeteners as they lost faith in the effectiveness of their use, their taste was improper or they preferred a natural alternative. However, an enthralling observation to note is that despite continuing with artificial sweeteners, nearly 60% of patients have used a natural alternative at some point of time, most commonly jaggery. As they have a general apprehension that all consumable synthetic products may have adverse effects.

As there was little knowledge ,attitude and practice of diabetic patients on artificial sweeteners, awareness was created about sweeteners and their use by showing a module on artificial sweeteners which contained FDA approved names of artificial sweeteners, different brand names with their content, their health benefits and also hazards.

Conclusion: Inadequate knowledge, indifferent attitude and improper practice regarding artificial sweeteners is more marked in highly educated type II diabetic patients. It is clinically known that non judicious use of artificial sweeteners can lead to health hazards like obesity, diabetes mellitus, cancer etc. which are the weaknesses to be addressed. Majority of the patients continue to irrationally consume sweeteners without any self-awareness on content & proper consumption of sweeteners, types of sugar substitutes, health benefits and hazards of sweeteners. Hence, there is a dire need to promote awareness about artificial sweeteners among diabetic patients in order to prevent any long term complications related to the consumption of these sweeteners.

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References:

1. Siervo M, Montagnese C, Mathers JC, Soroka KR, Stephan BC, Wells JC. Sugar consumption and global prevalence of obesity and hypertension: an ecological analysis. Public Health Nutr. 2014; 17:587–596.
2. Stanhope KL. Sugar consumption, metabolic disease and obesity: the state of the controversy. Crit Rev Clin Lab Sci. 2016;53:52–67.
3. Martyn DM, Nugent AP, McNulty BA, O'Reilly E, Tlustos C, Walton J, Flynn A, Gibney MJ. Dietary intake of four artificial sweeteners by Irish pre-school children. Food AdditContam Part AChem Anal Control Expo Risk Assess. 2016;33:592–602.
4. Li XE, Lopetcharat K, Drake MA. Parents' And children's acceptance of skim chocolate milks sweetened by monk fruit and stevia leaf extracts. J Food Sci. 2015;80:S1083–S1092.
5. Fujimaru T, Park JH, Lim J. Sensory characteristics and relative sweetness of tagatose and other sweeteners. J Food Sci. 2012;77:S323–S328.
6. Chattopadhyay S, Raychaudhuri U, Chakraborty R. Artificial sweeteners - a review. J Food Sci Technol. 2014;51:611–621.
7. Patil S, Ravi R, Saraswathi G, Prakash M. Development of low calorie snack food based on intense sweeteners. J Food Sci Technol. 2014;51:4096–4101.
8. Nahon DF, Roozen JP, de Graaf C. Sensory evaluation of mixtures of maltitol or aspartame, sucrose and an orange aroma. Chem Senses. 1998;23:59–66.
9. Joshi SR, Parikh RM. India - diabetes capital of the world: now heading towards hypertension. J Assoc Physicians India. 2007;55:323–4.

10. Kumar A, Goel MK, Jain RB, Khanna P, Chaudhary V. India towards diabetes control: Key issues. Australas Med J. 2013;6(10):524–31.
11. Wild S, Roglic G, Green A, Sicree R, King H. Global prevalence of diabetes-estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27(3):1047–53.
12. The Calorie Control Council.mht. [Last accessed on 2011 Feb 10].
13. De Koning L, Malik VS, Rimm EB, et al. Sugar-sweetened and artificially sweetened beverage consumption and risk of type 2 diabetes in men. AJCN 2011; 93:1321–1327.
1. 14.M. Yanina Pepino.Physiol Behav.2015 Dec 1;152(0 0):450-455. doi:10.1016/j.physbeh.2015.06.024
14. Welsh JA, Sharma A, Cunningham SA, Vos MB (2011). "Consumption of Added Sugars and Indicators of Cardiovascular Disease Risk Among US Adolescents". *Circulation*. 123(3): 249–57.
15. Tiemi saito et.al ..Assessment of the level of knowledge of diabetes mellitus patients about sweeteners, Demetra; 2013; 8(1); 39-51
16. Mayasah A. Sadiq, Alaa A. Salih. Knowledge and Attitude About Sweeteners Among Type 2 Diabetic Patients. Archives of Internal Medicine Research 1 (2018): 1-5.
17. Asif, M. (2014). The prevention and control the type-2 diabetes by changing lifestyle and dietary pattern. Journal of Education and Health Promotion, 3, 1

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