Journal of Research in Medical and Dental Science
2022, Volume 10, Issue 7, Page No: 014-017

Available Online at: www.jrmds.in
eISSN No.2347-2367: pISSN No.2347-2545

The Effect of Sweet and Salty Taste Sensitivity on Growth Parameters and Body Composition among Type 1 Diabetic Patients

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ABSTRACT

Background: The increased prevalence of overweight and obesity in childhood has implications for their future health. There are many potential contributors to overweight and obesity in childhood. Diabetes is becoming more common, which is a growing public health concern taste sensitivity, could be one of the risk factors leading to diabetes and obesity.

Aim: This study was conducted in order to determine the effect of taste detection thresholds on body compositions among type 1 diabetic patients and its relation to weight status.

Subjects and methods: A study design of cross-sectional comparative approach was adopted. All subjects with type 1 diabetes attending medical Hospitals with specific inclusion criteria were included in the sample of the current study (50 subject) which compared with healthy subjects (control group 70 subject) who were attending dental health centre from different geographical regions in Baghdad city/Iraq. The threshold sensitivity of salt and sweet taste was assessed using a two-alternative forced choice question with each component presented in five different quantities. Weight measurements were taken using a digital weighing scale, height measurements were done by using ordinary measuring tape. Body Mass Index (BMI) was calculated by using "BMI-for-age". Bioelectrical impedance technique was used for determining the subject's body composition.

Results: The findings of this research revealed that no significant association was found between diabetes status and taste thresholds, and between diabetic status and weight status, and the mean value of all body compositions were found to be higher in non-diabetic group with non-significant differences. While the relation between salt taste threshold and bone among diabetic group was significant.

Conclusion: Within the present data it was concluded that there was less considerable association between type 1 diabetes and body composition, and the diabetes status had no effect on taste detection thresholds.

Key words: Taste thresholds, Body composition, Diabetes

HOW TO CITE THIS ARTICLE: Tabarak Adil Rasool, Ban Sahib Diab, The Effect of Sweet and Salty Taste Sensitivity on Growth Parameters and Body Composition among Type 1 Diabetic Patients, J Res Med Dent Sci, 2022, 10 (7): 014-017.

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E-mail: tabarkadil222@gmail.com
Received: 23-Apr-2022, Manuscript No. JRMDS-22-42381;
Editor assigned: 25-Apr-2022, Pre QC No. JRMDS-22-42381 (PQ);
Reviewed: 09-May-2022, QC No. JRMDS-22-42381;
Revised: 23-Jun-2022, Manuscript No. JRMDS-22-42381 (R);
Published: 01-Jul-2022

INTRODUCTION

Diabetes mellitus is a chronic disease occurs either when the pancreas fails to produce enough insulin or when it is impossible to use insulin effectively in the body. Insulin is a blood sugar controlled hormone [1]. Five main tastes of sweet, umami (amino acid taste), and bitter, salty and sour are distinguishable by humans [2]. The taste is based on well-defined neuro-anatomical structures, the taste buds and afferent nerve fibres, which are responsible for the initial transduction, and ultimately leads to the sensation of taste [3]. The attraction to sweet taste is innate, so new-borns already like sweet-tasting stimuli. Previously they found that the perception of a sweet taste might have helped the early ancestors to identify carbohydrate-rich food and to ensure their intake of energy [4]. The last of the basic tastes that a new-born kid detects is salty (at approximately 4 months). It's mostly connected with sodium chloride's taste [5]. In the general population, taste problems are frequent. Despite the fact that these problems can have a considerable impact on quality of life and may indicate a serious underlying condition, the medical community frequently overlooks them [6]. Taste issues tend to be more common in diabetic patients; various taste impairments have been documented over the course of diabetes mellitus. Diabetes mellitus has been linked to a considerable and distinct impairment in glucose taste perception [7]. It is known that diabetes is only a possible consequence, among many other disorders, associated to obesity, which has increased its prevalence worldwide among young population [8].

Body Mass Index (BMI) is a practical way to assess children's obesity in a professional setting, and BMI charts are extensively used to counsel families on how to control their children's weight over time [9]. Mameli and his colleagues found that type 1 diabetes melitus patients presented a significantly lower ability in general to correctly identify taste qualities, especially bitter and sour tastes [10]. Salbe found a positive correlation between weight gain and a heightened response for sweet tastes in obesity subjects. While Pasquet and his colleagues evaluated the differences in taste perceptions of massively obese adolescents and taste perceptions of non-obese adolescents [11]. Higher taste sensitivity and a lower taste threshold, especially for sucrose and salt, were observed among the massively obese subjects compared to the non-obese adolescents. The present research's hypothesis was that the taste sensitivity has no effect on body composition of diabetic patient in relation to weight status [12]. The aim of this study was to assess the sweet and salt taste detection thresholds in diabetics, and its impact on body composition in relation to growth parameters.

LITERATURE REVIEW

The current study is a cross-sectional comparative study that was accepted by the scientific advisory committee of Baghdad University's College of Dentistry (number: 319). The sample of this study included all diagnosed cases of type 1 diabetic patients with HbA1c ≥ 7 and without other chronic or systemic diseases who were attending medical Hospital (50 persons), as well as a control group of people who appeared to be healthy and matched the study group's age and gender (70 persons). All information including: age, gender, anthropometric measurements, BMI, body composition and taste measures, were written on a separate case sheet. To evaluate taste threshold responsivity, a two-alternative forced choice question was used [13]. Five sodium chloride solutions (0.09, 0.18, 0.37, 0.75, 1.5 g/L) and five sucrose solutions (0.5, 1, 2, 4, 8 g/L) were used in the test. The participants were given each solution in a disposable plastic cup. Before expectorating, the subjects were instructed to assess the taste of each solution. When the participant made the proper choice, the same level of concentration was administered once more. When the participant made a wrong answer, the subject was given a higher-level trial. The assessment came to an end after two correct responses in a row [14].

An automatic digital weighing scale was used to take weight measurements. Subjects were weighed while wearing only light clothing and no shoes. Participants stood straight with their hands alongside their bodies and their feet, legs, waist, shoulders, and head against the wall, using common measuring tape secured at the wall to determine their height. BMI is estimated for children depending on their age and gender, and it is stated as a percentile, which can be found on a graph. The CDC growth chart was used to create all measurement methodologies. The examiner powered up the body fat monitor scale and entered personal information for each child, such as gender, age, and height. The child was then instructed to take off his or her footwear and carefully move onto the monitoring platform, placing his or her feet on the monitor's stainless steel strips (measured units) and remaining stable. The measured values (body fat%, muscles%, bones in Kg, and body hydration %) were alternately shown two times. When the measurement was finished, the examiner recorded each child's rating. Statistical analysis used include: descriptive statistics are mean, standard error for quantitative data while frequency and percentage for qualitative ones. Inferential statistics are independent T test, fisher exact and spearman correlation.

RESULTS

The current study's sample included 50 diabetes patients and 70 non-diabetic subjects between the ages of 12 and 14. According to the frequency distribution of the sample based on sweet taste threshold, 40% of diabetes children detect the sweet taste at concentrations of 8 gm/l, but only 37% of non-diabetic children detect the same concentration. However, the greatest concentration was missed by 54% of diabetics and 45.71% of non-diabetics. There is no significance association between diabetic state and the detection of sweet taste thresholds, according to statistical analysis. While the frequency distribution of the sample according to salt taste threshold revealed that diabetic children who detect the salt at concentration 0.75 gm/l account for only 16% of the total, which is higher than the nondiabetic group's 12.86 %. However, with increasing concentration, the opposite figure emerged, with nondiabetic children detecting the 1.5 gm/l accounting for 45.71% of the total. Table 1 shows the distribution of samples by weight status (BMI percentile) among diabetic and non-diabetic groups. While no significant association was found between diabetic status and weight status, healthy normal weight was the most common among both groups, followed by obese in the diabetic group and underweight in the non-diabetic group.

Table 1: The distribution of sample according weight status (BMI percentile) among diabetic and non-diabetic groups.

	Groups				Total	
	Diabetic group		Non-Diabetic group			
	N	%	N	%	N	%
Under weight	0	0	5	8.2	5	4.5
Normal weight	47	94	50	81.97	97	87.39
Over weight	1	2	2	3.28	3	2.7
Obese	2	4	4	6.56	6	5.41

Table 2 shows the mean value of all body compositions among diabetic and control groups which found to be greater in the non-diabetic group than the diabetic group with non-significant differences. Table 3 revealed the correlation coefficient between sweet and salt taste thresholds with body compositions among diabetic and non-diabetic groups. The correlation between salt taste threshold with fat and bone were in negative direction, while with muscles and hydration was in positive direction for both groups. However, all these relations were not significant except the relation between salt taste threshold and bone among diabetic group as it was significant. The relations among non-diabetic group differ as the sweet relations were significant in negative direction with fat while the relation were in positive direction significant with hydration.

Table 2: Body composition (mean, SD and SE) among groups.

Body composition	Groups								T-test	df	P-value
	Diabetic group				Non-Diabetic group						
	N	Mean	± SD	± SE	N	Mean	± SD	± SE			
Fat%	50	19.9	10.231	1.447	61	20.108	19.59	2.508	0.068	109	0.946
Muscles%	50	44.734	8.162	1.154	61	46.811	8.091	1.036	1.341	109	0.183
Bone	50	4.62	1.35	0.191	61	5.087	1.655	0.212	1.604	109	0.112
Hydration%	50	58.43	7.248	1.025	61	59.877	7.391	0.946	1.035	109	0.303

Table 3: The correlation coefficient between sweet and salt taste thresholds and body composition among groups.

Groups		Salt taste	Sweet taste		
		rsp	p value	rsp	p value
Diabetic group	fat	-0.184	0.202	0.027	0.851
	muscles	0.026	0.859	0.083	0.567
	bone	-0.376	0.007	0.097	0.502
	hydration	0.179	0.213	-0.026	0.858
Non-diabetic group	fat	-0.087	0.503	-0.253	0.049
	muscles	0.176	0.175	0.246	0.056
	bone	-0.097	0.455	-0.185	0.154
	hydration	0.135	0.3	0.256	0.046

DISCUSSION

One of the most important oral chemical senses is the sense of taste that plays an important role in daily health. The taste threshold rises by a variety of factors including local and systemic disease such as diabetes. The dynamics of BMI in children from birth to adolescence are unknown, and it's crucial to figure out whether susceptibility to the development of persistent obesity occurs at a particular age in adolescents. This study was designed and conducted to determine the relationship between diabetes statuses, taste thresholds, BMI and body composition. Because there was no significant difference between groups, age and gender were not regarded as confounders.

In the present study the frequency distribution according to sweet taste thresholds revelled that both diabetes and control groups who detected the higher sucrose concentrations were formed the higher percentages, even though there was no significant difference in detection thresholds. This disagrees with Mameli and his colleague's research. Another finding addressing the frequency distribution of salt taste thresholds revealed that groups that detect higher salt concentrations comprised a higher percentage of both groups, with no significant differences in detection thresholds. These findings on sweet and salt are in contrast to a study by khobragade that indicated a significant increase in taste thresholds for sweet, salt, sour, and bitter in type 1 diabetics. Most of the relationships between sweet and salt taste thresholds and body compositions in diabetes and non-diabetic groups were not significant in this investigation. This is in agreement with Kirsten who reported no significant influence of a high taste threshold on body composition [13]. The findings demonstrated that there was a strong association between salt taste threshold and bone density in diabetics. Which could be taken as a link between increased sodium consumption and weaker bones? The bones store both sodium and calcium. Sodium raises calcium excretion, and low calcium levels are linked to low bone mineral density, which is a risk factor for fractures. While calcium cannot be added to bone beyond adolescence, it can follow sodium out of the bone and into the urine for the rest of one's life [14]. While the relationships between sweet taste and fat were significant in the negative direction in the non-diabetic group, this contradicts Ettinger who found that subjects in the overweight BMI and body fat groups had higher sucrose threshold values than the normal groups, and that the overweight BMI and body fat groups had a significantly increased liking for sweetness.

CONCLUSION

The diabetes status had no impact on the thresholds for salty and sweet taste detection and the percentage of all body components in the control group was higher, but not considered. In diabetic group there was inverse relation between salt taste and bone. Among non-diabetic group there was a direct positive relation between sweet taste and hydration and inverse relation with fat. Future research needs to be carried out in order to identify whether body fat and measure can be a predictive tool for sweetness preference.

REFERENCES

1. Witt M. Anatomy and development of the human taste system. Handbook Clin Neurol 2019; 164:147-171.
2. Kinghora AD, Soejarto DD, Inglett GE. Sweetening agents of plant origin. Crit Rev Plant Sci 1986; 4:79-120.
3. Stein LJ, Cowart BJ, Beauchamp GK. The development of salty taste acceptance is related to dietary experience in human infants: A prospective study. Am J Clin Nutr 2012; 95:123-129.
4. Khobragade RS, Wakode SL, Kale AH. Physiological taste threshold in type 1 diabetes mellitus. Ind J Physiol Pharmacol 2012; 56:42-47.
5. Seidell JC. Obesity, insulin resistance and diabetes-a worldwide epidemic. Br J Nutr 2000; 83:5-8.
6. Rudolf MC, Krom AJ, Cole TJ. How good are BMI charts for monitoring children's attempts at obesity reduction? Archiv Dis Childhood 2012; 97:418-422.
7. Mameli C, Cattaneo C, Lonoce L, et al. Associations among taste perception, food neophobia and preferences in type 1 diabetes children and adolescents: A cross-sectional study. Nutrients 2019; 11:3052.
8. Salbe AD, DelParigi A, Pratley RE, et al. Taste preferences and body weight changes in an obesity-prone population. Am J Clin Nutr 2004; 79:372-378.
9. Arbisi PA, Billington CJ, Levine AS. The effect of naltotrexone on taste detection and recognition threshold. Appetite 1999; 32:241-249.
10. Mojet J, Christ-Hazelhof E, Heidema J. Taste perception with age: Pleasantness and its relationships with threshold sensitivity and supra-threshold intensity of five taste qualities. Food Quality Preference 2005; 16:413-423.
11. Egil E, Mentes A. Taste perception in school children: Is there an association with dental caries? Balkan J Dental Med 2020; 24:102-106.
12. Kirsten VR, Wagner MB. Salt taste sensitivity thresholds in adolescents: Are there any relationships with body composition and blood pressure levels? Appetite 2014; 81:89-92.
13. Carbone L, Johnson KC, Huang Y, et al. Sodium intake and osteoporosis. Findings from the Women's Health Initiative. J Clin Endocrinol Metabol 2016; 101:1414-1421.
14. Ettinger L, Duizer L, Caldwell T. Body fat, sweetness sensitivity, and preference: Determining the relationship. Canadian J Diet Pract Res 2012; 73:45-48.