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Sensory Assessment of Traditional Pumpkin and Bottle Gourd Sweets Enriched with Paneer for Renal Patients

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Abstract: The impaired functions of the kidneys in the renal diseases alter the blood parameters as the waste gets accumulated in the blood and can affect overall health significantly. Proper diet management with foods allowed and avoided is a part of the treatment and important preventing further complications. Many patients report non-compliance to the renal diets due to limited food choices and. Therefore, developing healthy, tasty, and kidney friendly recipes for renal patients is necessary to improve their nutritional intake and food satisfaction. In this study, indigenous sweet recipes barfi and halwa were selected. Pumpkin and bottle gourd vegetables were chosen considering their traditional use in these sweets and also the protein and mineral content. The recipes were formulated as pumpkin and bottle gourd barfi and halwa as the control sample whereas enrichment with paneer (30 g and 50g) served as experimental variations due to suitability of paneer in these sweet preparations and it high biological value protein content. The formulated recipes were evaluated for sensory characteristics such as appearance, flavour, texture, taste, mouthfeel, and overall acceptability using a 9-point hedonic scale with the help of a panel of judges. For both pumpkin and bottle gourd Barfi and Halwa, the variations with addition of 30 g paneer found not significant ($p > 0.05$) and hence highly accepted by the judges but for the addition of 50 g paneer significant difference was found ($p < 0.05$) which indicated non-acceptance by the judges. The nutritive analysis also showed an increase in protein and energy content in the experimental recipes, which made them more beneficial for renal patients.

Keywords*: Sensory Assessment, Traditional Sweets, Enrichment, Paneer, Renal Patients.*

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I. INTRODUCTION

Renal disease, often known as kidney disease, is a medical illness in which the kidneys are unable to perform their normal physiological functions, including controlling blood pressure and red blood cell production, filtering out metabolic waste, and maintaining fluid and electrolyte balance. Acute or persistent symptoms of this illness might result in a progressive decline in kidney function and potential systemic issues (Escott-Stumps, 2008). According to World Health Organization 2026, an estimated 674 million people have chronic kidney disease worldwide; most reside in low- and middle-income countries. Chronic kidney disease affects populations in different regions of the world unequally, likely as a result of differences in population demographic characteristics, their comorbidities, and access to health care resources (Kovesdy, 2022).

The kidneys excrete metabolic waste products, such as urea and creatinine. When kidney function declines, these substances accumulate to toxic levels in the blood, leading to uremia. For prevention and also for the treatment of renal diseases diet management is absolutely necessary. People with chronic kidney diseases not only face sodium, potassium and other mineral imbalances but also suffer nutritional issues such as vitamin deficiencies and protein energy malnutrition. A conventional renal diet usually allows moderate protein intake and restricts sodium, potassium and phosphorus intake. Many patients with chronic kidney diseases are not aware due to various factors how right foods help to improve their condition or they may feel the diet too restrictive. This eventually makes it difficult for them to follow the dietary guidelines

According to Pereira et al. (2020), understanding the many cultural customs surround eating is crucial to developing more effective nutritional therapy strategies

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because these customs interact with each person's subjectivity. Additionally, in order to ensure quality, changes in the intake of key nutrients should be made while taking the global context of the diet into consideration. Kramer (2019) requisitioned the clinicians to consider the dietary patterns, traditions, and culture of the chronic kidney disease patients when providing dietary advice and utilize medical nutrition therapy services to guide patients to a healthier diet.

Kar and Koley (2025) provided evidences which supports individualized, balanced nutrition with adequate calories, moderate protein restriction, and optimal micronutrient intake are beneficial for chronic kidney disease patients. Kim and Jung (2020) stated that effective nutritional management is difficult for patients with chronic kidney disease because of numerous dietary considerations and for this reason customized approaches are required to get the best possible outcome whereas Khanna et al. (2025) indicated that along with tailored dietary advice, addressing non-medical barriers such as financial constraints and access to trained nutritionists is also essential for optimizing the nutritional status of patients

Uchiyama-Tanaka (2025) emphasized the importance of nutritionally modified meal planning to support kidney function and slow the disease progression using newer approaches which corroborates improving the quality of dietary protein and increasing the intake of fiber-rich plant foods to promote gut health and metabolic balance in chronic kidney disease patients. The author also discussed the role of personalized dietary planning, including the adaptation of culturally appropriate recipes, to enhance patient adherence and nutritional status. Sinha and Prasad (2025) also emphasized the importance of correcting common misconceptions related to food restrictions and promoting realistic, patient-centered meal planning strategies.

Despite the critical role of diet, existing resources and dietary guidelines often do not adequately address the practical problems encountered by chronic kidney dieses patients, resulting in considerable confusion about food choices and limited adherence to diet. In particular, there is a lack of accessible, culturally appropriate and better-nutrient-rich traditional recipes that offer variety and enjoyment while strictly respecting dietary restrictions. As a result, fear of adverse health outcomes often leads patients to consume limited quantities of familiar foods.

Among the commonly consumed vegetables, bottle gourd and pumpkin are considered kidney-friendly. As per the Indian Food Composition Tables 2017, 100 g of Bottle gourd and pumpkin contains protein 0.53 mg and 0.87 mg; sodium 1.46 mg and 5.21 mg; potassium 124 mg and 186 mg and phosphorous 16 mg and 24.51 mg respectively. Paneer or cottage cheese per 100g provides proteins 18.86, sodium 18.04, potassium 63.53 and phosphorous 330 mg. Paneer serves as an excellent source of protein for vegetarians as the proteins are of high biological value. It also contains substantial amount of phosphorus, but depending on the blood parameters, it can be added to the diets of renal patients. The judicious use of kidney-friendly vegetables and paneer in the diet is appropriate and helpful for patients. The goal of this study was to provide patients with greater dietary variety and more options, enabling them to enjoy their food and feel satisfied while maintaining stable blood levels and protecting their kidneys from further damage.

II. METHODOLOGY

The traditional sweet recipes selected were Barfi and Halwa. Barfi is a fudge like sweetmeat cooked with sugar to the soft-ball stage, spread evenly to the desired thickness and cut into pieces. Halwa is a sweet in which dry or wet ingredients roasted with fat and milk or water is added to form soft lump texture. Condensed milk or khoya is preferred in many halwa preparations for rich creamy texture and aroma.

For the study, the recipes formulated and developed were Pumpkin Barf, Bottle gourd Barfi, Pumpkin Halwa and Bottle gourd Halwa with their conventional form as a control and experimental forms with the addition of paneer in different quantities (30 g and 50 g). As the vegetables pumpkin and bottle gourd are high in water content, the 100 g raw weight of the vegetables after cooking was not found sufficient for the recipe form. Hence, 200 g of edible portion of the raw vegetables were used and in all the variations along with the 50 g of sugar and 5 g of fat. No garnishing ingredients were used and for flavor only cardamom was used. The vegetables used were washed, peeled and cut into pieces, boiled in water and drained thoroughly to leach out the potassium. About 50-60 per cent of potassium gets reduced by this method of leaching. The conventional method of preparation was used in which the vegetables sautéed in fat; sugar was added and cooked till the desired consistency to get the respective form of the recipe. In the paneer enriched variations, finely mashed paneer was added after sautéing the vegetables. The recipes were standardized and then evaluated through sensory analysis using a 9-point hedonic scale by a panel of ten judges. The sensory attributes studied were appearance, flavor, texture, taste, mouthfeel, and overall acceptability. Nutritive values such as energy, carbohydrate, protein, fat, sodium, potassium, and phosphorus were also calculated. Statistical analysis was carried out by using the ANOVA with Tukeys Post-hoc to determine the significance of difference between control and experimental samples.

III. RESULTS AND DISCUSSION

The scores obtained from the individual sensory panelists from the three consecutive assessments trials were compiled. The mean±SD scores were obtained for each sensory attribute of the developed recipe and the data analyzed statistically.

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Table 1 Mean Scores of Sensory Assessment of Pumpkin Barfi and Pumpkin Halwa

Samples	Appearance (Mean ± SD)	Flavor (Mean ± SD)	Texture (Mean ± SD)	Taste (Mean ± SD)	Mouthfeel (Mean ± SD)	Acceptability (Mean ± SD)
Pumpkin Barfi	8.56 ± 0.38[a]	8.49 ± 0.47[a]	8.6 2± 0.24[a]	8.59 ± 0.41[a]	8.7 3± 0.26[a]	8.76 ± 0.31[a]
Pumpkin Barfi + 30 g paneer	8.63 ± 0.33[a]	8.89 ± 0.22[a]	8.66 ± 0.27[a]	8.93 ± 0.14[a]	8.89 ± 0.22[a]	8.9 ± 0.10[a]
Pumpkin Barfi + 50 g paneer	7.06 ± 0.73[b]	7.39 ± 0.71[b]	7.22 ± 0.64[b]	6.9 3± 0.96[b]	6.39± 0.87[b]	6.63 ± 0.33[b]
Pumpkin Halwa	8.36 ± 0.36[a]	8.39 ± 0.40[a]	8.56 ± 0.22[a]	8.63 ± 0.33[a]	8.33 ± 0.26[a]	8.46 ± 0.42[a]
Pumpkin Halwa + 30 g paneer	8.73 ± 0.26[a]	8.83 ± 0.23[a]	8.72 ± 0.21[a]	8.86 ± 0.17[a]	8.69 ± 0.39[a]	8.86 ± 0.32[a]
Pumpkin Halwa + 50 g paneer	7.26 ± 0.73[b]	7.53 ± 0.68[b]	7.29 ± 0.55[b]	7.03 ± 1.02[b]	6.53 ± 0.90[b]	6.89 ± 0.60[b]

[a] Means having No Significant Difference
[b] Means having Significant Difference

The sensory assessment mean scores of pumpkin barfi and pumpkin halwa formulations revealed noticeable differences in acceptability by the panel of judges among the samples.

For all the sensory attributes, the pumpkin barfi received mean scores from minimum 8.49 to maximum 8.76, whereas the pumpkin halwa received mean scores from 8.33 to 8.63. Experimental pumpkin barfi and pumpkin halwa formulations enriched with 30 g and 50 g paneer achieved mean scores from 8.63 to 8.93 and 6.39 to 7.39, 8.69 to 8.86 and 6.53 to 7.53 respectively. It was observed that addition of 50 g paneer obtained lower scores in both pumpkin barfi and pumpkin halwa variations.

The p-value corresponding to the F-statistics of one-way ANOVA in both Pumpkin barfi and Pumkin Halwa is lower than 0.05 denoting significant difference in control and experimental variations. The Tukeys post –hoc test was applied in which no significant difference ($p < 0.05$) was found between Control and 30 g paneer enriched experimental variation. However, the test revealed significant difference between Control and 50 g paneer enriched experimental variation and also between experimental variations 30 g and 50g addition of paneer in both pumpkin barfi and halwa. Therefore, addition of with 30 g paneer improved the sensory quality of pumpkin barfi and halwa, whereas the addition of 50 g paneer unfavorably influenced sensory characteristics and overall acceptability.

Table 2 Mean Scores of Sensory Assessment of Bottle Gourd Barfi and Bottle Gourd Halwa

Samples	Appearance (Mean ± SD)	Flavor (Mean ± SD)	Texture (Mean ± SD)	Taste (Mean ± SD)	Mouthfeel (Mean ± SD)	Acceptability (Mean ± SD)
Bottlegourd Barfi	8.56±0.38[a]	8.53±0.45[a]	8.59±0.37[a]	8.59±0.34[a]	8.56±0.22[a]	8.79±0.23[a]
Bottlegourd barfi +30g paneer	8.71±0.34[a]	8.88±0.22[a]	8.66±0.22[a]	8.96±0.10[a]	8.83±0.28[a]	8.93±0.14[a]
Bottlegourd barfi +50g paneer	7.06±0.73[b]	7.39±0.71[b]	7.22±0.64[b]	6.93±0.84[b]	6.63±0.573[b]	6.79±0.32[b]
Bolttle gourd Halwa	8.46±0.39[a]	8.49±0.42[a]	8.62±0.24[a]	8.69±0.24[a]	8.26±0.26[a]	8.46±0.44[a]
Bottlegourd halwa+30g paneer	8.83±0.23[a]	8.86±0.23[a]	8.76±0.22[a]	8.89±0.16[a]	8.81±0.31[a]	8.95±0.11[a]
Bottlegourd halwa+50g paneer	7.56±0.61[b]	7.73±0.64[b]	7.59±0.51[b]	7.29±0.74[b]	6.69±0.72[b]	6.89±0.60[b]

[a] Means having No Significant Difference
[b] Means having Significant Difference

For the control treatment of bottle gourd barfi and bottle gourd halwa formulations, the mean scores ranging from 8.53 to 8.79 and 8.26 to 8.69 respectively were reflecting better scores bottle gourd barfi. In all the experimental variations of addition of 30 g and 50 g paneer to bottle gourd barfi, the mean scores ranged from 8.66 to 8.96 and 6.63 to 7.39, and for bottle gourd halwa 8.81 t0 8.95 and 6.69 to 7.59 respectively. Addition of 50 g paneer also recorded minimum scores in both bottle gourd barfi and halwa preparations for all the sensory attributes.

The mean scores of each experimental variation were compared with the mean scores of their respective control sample using ANOVA which revealed a statistically significant difference ($p<0.05$) hence the Tukeys post –hoc pair wise comparisons showed no significant difference ($p <$

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0.05) between control and 30 g paneer enriched experimental variations in both the bottle gourd barfi and halwa. On the other hand, in both bottle gourd barfi and halwa, a significant difference was found between Control and experimental variation with 50 g paneer and also between experimental variations 30 g and 50g addition of paneer.

The 50 g paneer samples consistently received the lowest scores across all attributes, suggesting that addition of excessive amounts of paneer negatively affected the sensory qualities of both the sweets and consequently not accepted by the judges.

IV. CONCLUSION

The formulations of traditional sweet recipes – Barfi and Halwa made with pumpkin and Bottle gourd enriched with the moderate amount of paneer (30g) were successful and well accepted by the panel of judges. These can be advised to be included in the diets of the renal patients of all ages keeping in mind their blood parameters and stages of the disease, conditions like hyperkalemia, hyperphosphatemia, and renal-specific dietary guidelines. The study also provides scope for the development of similar recipes with the enrichment of paneer for renal patients.

REFERENCES

[1]. Escott-Stumps, L. K. (2008). Krause's Food and Nutrition Therapy. Washington: John Roers.
[2]. Kramer H. (2019). Diet and Chronic Kidney Disease. *Advances in nutrition (Bethesda, Md.)*, *10*(Suppl_4), S367–S379. https://doi.org/10.1093/advances/nmz011
[3]. Kovesdy C. P. (2022). Epidemiology of chronic kidney disease: an update 2022. *Kidney international supplements*, *12*(1), 7–11. https://doi.org/10.1016/j.kisu.2021.11.003
[4]. Longvah, T., Ananthan, R., Bhaskarachary, K., & Venkaiah, K. (Eds.). (2017). *Indian food composition tables 2017*. National Institute of Nutrition, Indian Council of Medical Research, Department of Health Research, Ministry of Health and Family Welfare, Government of India. https://www.nin.res.in/ebooks/IFCT2017.pdf
[5]. Mitali Kar and Shyamal Koley, Impact of renal diet on wellbeing of the patients of chronic kidney disease undergoing hemodialysis: A review. Int J. Nephrol. Res. 2025;7(2):52-58. DOI: https://www.doi.org/10.33545/26646692.2025.v7.i2a.34
[6]. Pradhan, N., Kerner, J., Campos, L. A., & Dobre, M. (2025). Personalized Nutrition in Chronic Kidney Disease. *Biomedicines*, *13*(3), 647. https://doi.org/10.3390/biomedicines13030647
[7]. Pereira, R. A., Ramos, C. I., Teixeira, R. R., Muniz, G. A. S., Claudino, G., & Cuppari, L. (2020). Diet in Chronic Kidney Disease: an integrated approach to nutritional therapy. *Revista da Associacao Medica Brasileira (1992)*, *66Suppl 1*(Suppl 1), s59–s67. https://doi.org/10.1590/1806-9282.66.S1.59
[8]. Sinha, A., & Prasad, N. (2025). How to Give Dietary Advice to Patients with Kidney Disease?. *Indian journal of nephrology*, *35*(2), 178–186. https://doi.org/10.25259/IJN_139_2024
[9]. Uchiyama-Tanaka, Y. Chronic kidney disease and diet. *Ren Replace Ther* 11, 71 (2025). https://doi.org/10.1186/s41100-025-00668-x
[10]. World Health Organization. (2026, April 20). Newsroom/Factsheets/Details/ Kidney Disease. who.int