FOOD PREFERENCES AND AVERSION TO

FOOD AMONG PATIENTS WITH CKD

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment of B.Sc. in Nutrition and Food Engineering

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APPROVAL

This Project titled **"Food preferences and aversion to food among patients with CKD"**, submitted by Kazi Faria Islam Hiya to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents. The presentation has been held on August 2023.

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We hereby declare that this project has been done by us under the supervision of **Mr. Md. Shamsur Rahman, Lecturer, Department of NFE**, Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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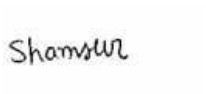

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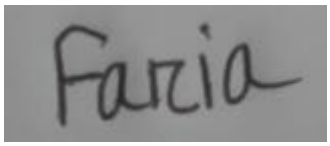

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ABSTRACT

Chronic kidney disease (CKD) is a prevalent and significant health concern affecting a considerable number of individuals in Dhaka City, Bangladesh. In addition to the impairment of kidney function, CKD has a profound impact on various aspects of a patient's life, including their dietary habits and food preferences. This research project focused on investigating the food preferences and aversions among patients with chronic kidney disease (CKD) in Dhaka City, Bangladesh. The aim was to understand how CKD impacts taste changes and food choices among affected individuals. The study utilized a questionnaire-based survey conducted at MH Samorita Hospital and Medical College, including both CKD patients and a control group of healthy individuals. The questionnaire covered a wide range of factors related to food preferences and habits. Demographic information such as age, gender, and socioeconomic status was collected to provide a comprehensive understanding of the participants. The survey also explored aspects such as appetite, food allergies, salt consumption, smoking and alcohol habits, comorbidities, family history of kidney disease, swelling, and water intake.To assess food preferences, participants were asked to rate their liking or aversion towards various food groups using a Likert scale. This allowed for a quantitative analysis of their preferences. The collected data were then analyzed using statistical software to derive meaningful insights.The results revealed that CKD patients experienced notable changes in their taste preferences and exhibited aversions to specific food groups. Furthermore, they reported a poorer appetite compared to the control group. These findings shed light on the dietary challenges faced by CKD patients and emphasize the need for personalized nutritional interventions tailored to their specific needs.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER 1

1.1 Introduction

Chronic Kidney Disease (CKD) is a complex condition characterized by a gradual deterioration in kidney function, impeding their ability to efficiently remove waste products from the bloodstream [1]. This deterioration is marked by persistent abnormalities in either the structure or function of the kidneys, such as a reduced glomerular filtration rate (GFR) of less than 60 milliliters per minute per 1.73 square meters or an albuminuria level exceeding 30 milligrams per 24 hours [2]. These abnormalities must persist for a period exceeding three months to warrant a diagnosis of CKD. Remarkably, CKD exerts its impact on a substantial portion of the global population, affecting anywhere from 8% to 16% of individuals worldwide [3].

In developed nations, two primary culprits stand out as the leading causes of CKD: diabetes and hypertension. These chronic conditions place significant stress on the kidneys over time, gradually compromising their ability to function optimally. As a result, CKD has become a prevalent concern in many developed nations [4].

Turning our attention to Bangladesh, a densely populated developing nation located in the Southeast, a concerning trend is emerging. The annual prevalence of CKD in this region is on a steady rise, posing a significant public health challenge. The reasons for this surge in CKD cases warrant further investigation, encompassing factors ranging from lifestyle changes to potential environmental influences [5].

One aspect of CKD that has received relatively less attention, yet holds significant importance, is the alteration in taste perception experienced by individuals with this condition. Taste plays a pivotal role in our lives, influencing not only our dietary choices but also our cultural and social experiences. For CKD patients, this change in taste can have wide-ranging impacts on their sociological, cultural, and nutritional well-being [6]. It may affect their interest in food, their nutritional status, their mood, and their overall quality of life. These alterations, while potentially vexing and distressing, provide valuable insights into the multifaceted nature of CKD.

In addition to changes in taste, CKD patients grapple with the challenge of managing excess sodium and fluid retention within their bodies . This accumulation can lead to a host of complications, including shortness of breath, elevated blood pressure, swelling in the ankles, and the build-up of fluids around the heart and lungs. Therefore, it is imperative for CKD patients to adhere to a dietary regimen that restricts sodium intake to less than 2 grams per day [7].

Furthermore, a diet that is excessively high in protein may lead to the build-up of waste products in the bloodstream. The kidneys, compromised by CKD, may struggle to filter out these waste products efficiently. Thus, a balanced approach to protein intake is crucial for individuals grappling with CKD.

CHAPTER 2

2.1 Literature Review

Chronic Kidney Disease (CKD) can result from various underlying causes. High blood pressure gradually strains the small blood vessels in the kidneys, hindering their proper function. Similarly, in cases of diabetes, elevated blood glucose levels can harm the kidney's filtration system. Additionally, a buildup of fatty deposits in the blood vessels due to high cholesterol levels can further impede kidney function [8].

Moreover, specific renal conditions, such as glomerulonephritis, can contribute to CKD. This involves kidney inflammation, potentially leading to obstructions in urine flow. Contributing factors include recurrent kidney stones, an enlarged prostate, and prolonged use of specific medications. Polycystic kidney disease, an inherited condition characterized by cyst growth in the kidneys, can also develop from these conditions [9].

Taste Changes in CKD

As renal function, indicated by the estimated glomerular filtration rate (eGFR), falls below 15, sensory changes can occur. These taste alterations are influenced by a variety of factors, including genetic predisposition, accumulation of uraemic toxins, metabolic imbalances, fluid irregularities, a diminished number of taste buds, and changes in saliva composition [10].

Anatomical Overview of the Tongue

The human tongue is anatomically divided into anterior and posterior thirds. The anterior two-thirds host four types of surface papillae dispersed across the tip and lateral borders, while circumvallate and foliate papillae are located on the posterior third. Innervation of the posterior third, including surface foliate and circumvallate papillae, is provided by the glossopharyngeal nerve (IX cranial nerve). The anterior two-thirds, along with the soft palate (via the greater petrosal nerve) and the chorda tympani, receive innervation from the facial nerve (VII cranial nerve) [11].

The Role of the Vagus Nerve

The tenth cranial nerve, known as the vagus nerve, is instrumental in transmitting sensation from the human pharynx. It plays a pivotal role in taste perception, along with taste receptors, human saliva, zinc, and the central transmission of taste sensations [12].

Taste Perception Process

Taste buds house receptor cells crucial to taste perception. Chemical compounds, or taste-stimulating agents, interact with taste receptors in specific manners [13]. This interaction can be summarized as follows:

Perception of saltiness occurs only when salivary NaCl concentration surpasses the background level to which receptors are acclimated. Type 1 cells are primarily involved in salt taste perception, but in higher sodium concentrations, type III presynaptic receptors can also transmit a salty taste. This sensation arises when alkali metals, such as sodium, enter the taste bud.

Detection of these tastes is associated with G-protein coupled receptor cells. Type II receptor cells do not respond to salty or sour tastes. Each taste is transduced by its respective type II receptor cells based on the expressed taste receptor proteins.

Sourness is perceived when hydrogen ions traverse hydrogen channels on taste buds. Taste categories can be succinctly categorized as salt, sweet, savory, sour, and bitter. Type III presynaptic receptor cells detect sourness and respond to acidic stimuli [14].

CHAPTER 3

3. Methodology

3.1 Study Design and Sample size

This study adopted a case-control design, enrolling both CKD patients and healthy controls. The CKD patients were recruited from carefully chosen hospitals and nephrology clinics, while the healthy controls were matched in terms of age, sex, and socioeconomic status. The study aimed to include a total of 30 CKD patients and 30 healthy controls in its sample size.

3.2 Data Collection

Comprehensive data encompassing socio-demographic, clinical, and nutritional aspects were meticulously collected from both the CKD patients and the healthy controls. This wide-ranging information aimed to provide a holistic understanding of the participants' backgrounds, medical histories, and dietary habits, contributing to a robust analysis of taste perception and food preferences.

To evaluate the participants' preferences for different food groups, a well-established 9-point hedonic scale was employed within the questionnaire. This scale allowed participants to express their levels of liking or disliking for specific food categories, thereby enabling a nuanced assessment of their attitudes toward various flavors, textures, and types of foods. By utilizing this standardized scale, the study aimed to quantitatively measure the participants' subjective responses and preferences, adding an objective dimension to the investigation.

3.3 Statistical Analysis

The statistical analysis encompassed various techniques, including descriptive statistics, chi-square tests, t-tests, and multivariate regression analysis. These methods were employed to uncover correlations between alterations in taste, food preferences, and possible influential factors. The Statistical Package for the Social Sciences (SPSS) software was employed as the tool for conducting these analyses.

3.4 Ethical Considerations

This study adhered to ethical guidelines, ensuring the privacy, confidentiality, and informed consent of all participants. Ethical approval was obtained from the research ethics committee of Daffodil International University.

CHAPTER 4

Result and Discussion

4.1 Sociodemographic and clinical information

The sociodemographic and clinical characteristics presented in Table 1 offer important contextual insights into the composition of the CKD and control groups, enriching our understanding of potential factors influencing taste perception and food preferences within these cohorts. The gender distribution demonstrated a balanced representation in both groups, which is crucial for evaluating potential gender-related differences in taste and food preference (Santos et al., 2020). The nearly equal distribution of age groups in both samples provides an opportunity to explore how age might contribute to variations in taste perception and food preferences within the context of CKD (Ueland et al., 2019). The observed disparity in education levels, with more CKD patients having primary education, suggests potential implications for dietary understanding and adherence among CKD patients (Khattak et al., 2020). Furthermore, the prevalence of CKD patients from rural areas could signify the role of regional dietary patterns in influencing taste and food preferences (Kutluturk et al., 2018). Socioeconomic differences are evident through the monthly family income distribution, which might introduce variations in dietary choices and preferences (McColl et al., 2017). Additionally, the higher prevalence of diabetes among CKD patients aligns with the well-established link between CKD and diabetes (Huang et al., 2021), warranting careful consideration as a potential confounding factor in taste and food preference analyses. These characteristics collectively emphasize the complexity of factors that could shape individuals' dietary choices and preferences, underscoring their relevance in the subsequent interpretation of taste perception and food preference findings.

Table 1 : Socio demographic and clinical information

Characteristics	**C information KD Sample (N=30)**		**Control Sample (N=30)**
Sex			
Male	14		14
Female	16		16

Age (year)			
18-59	16		16
60 and older	14		14
Education Level			
Primary	24		14
Secondary and higher	6		16
Living Area			
Urban	17		23
Rural	13		7
Monthly Family Income (BDT)			
10,000-20,000	3		2
20,000-30,000	12		6
>30,000	15		22
Body Mass Index			
>18.5	0		0
18.5-24.9	20		14
25-29.9	8		14
30-34.9	2		2
Diabetic			
Yes	28		9
No	8		21

4.2 Appetite and Food Aversion Patterns in CKD Patients and Controls

Table 2 reveals striking differences in appetite and food aversion between the CKD group and the control group, underscoring the potential impact of chronic kidney disease on these aspects. Among the CKD patients, 15 individuals reported poor appetite, indicating a significant portion of the group experiencing reduced desire for food. In contrast, none of the control group participants exhibited poor appetite, highlighting a distinct pattern within healthy individuals. The disparity in appetite could be attributed to CKD-related factors such as altered metabolism, hormonal imbalances, and dietary restrictions, which can collectively contribute to reduced appetite (Bossola et al., 2019). Additionally, a noteworthy finding is the presence of aversion to food among 26.66% of the CKD group, in contrast to the absence of aversion in the control group. This observation aligns with previous studies suggesting that aversions to specific foods might be more prevalent in CKD patients due to altered taste perception and gastrointestinal disturbances (Ikizler, 2018; Monk et al., 2019). The absence of food aversion in the control group could be indicative of the intricate interplay between CKD and altered taste perceptions, potentially leading to aversions among CKD patients. Collectively, these findings highlight the unique challenges CKD patients face in maintaining appetite and tolerating food, underscoring the need for tailored dietary interventions to address these specific concerns.

Table 2: Appetite and food aversion

	CKD Group (N=30)	**Control Group (N=30)**
Appetite		
Poor	15	0
Normal	14	30
Aversion to food		
Yes	8 (26.66%)	0
NO	22 (73.34%)	30

4.3 Differential Food Preferences in Chronic Kidney Disease Patients and Controls

The insights provided by Table 3 illuminate distinctive patterns in food preferences between CKD patients and the control group, offering valuable glimpses into the intricate interplay

between dietary restrictions, physiological changes, and taste perceptions within the context of chronic kidney disease.

An intriguing finding is the discernible decrease in preference for red meat and poultry among CKD patients, as compared to the control group. This discrepancy can be attributed to the dietary recommendations often provided to CKD patients, which typically emphasize reduced protein intake to alleviate potential renal stress (Lew et al., 2019). The reduced preference for these protein-rich sources might reflect the conscious adherence to these dietary guidelines among CKD patients.

Similarly, the lower fish preference within the CKD group could be connected to the particular emphasis on fish consumption in renal diets due to its potential cardiovascular and anti-inflammatory benefits (Pisani et al., 2018). The dietary recommendations for CKD patients often underscore the importance of incorporating omega-3 fatty acids through fish consumption, possibly impacting the observed preferences in this study.

The decreased preference for leafy vegetables among CKD patients could be tied to the restricted intake of potassium and other minerals commonly found in these vegetables, aimed at managing electrolyte imbalances (Hariharan et al., 2018). This finding emphasizes the influence of dietary limitations on taste preferences and the need for tailored dietary counseling to mitigate the aversion to specific nutrient-rich foods.

Interestingly, the relatively stable preference for milk and milk products within the CKD group signifies a potential acceptance of these items within their dietary restrictions (Kalantar-Zadeh et al., 2018). The preservation of preference for these dairy sources highlights the importance of nutrient density and taste perception in maintaining a satisfying dietary experience for CKD patients.

Moreover, the higher preference for drinks and sweets among CKD patients might reflect a nuanced interplay between dietary restrictions, medication regimens, and altered taste perceptions (Rigo et al., 2021). The propensity to opt for liquid-based and sugary options might be influenced by factors such as thirst due to reduced kidney function and potential changes in taste sensitivity, warranting further investigation.

In conclusion, the variations in food preferences observed across diverse categories between CKD patients and controls underline the intricate interplay between dietary restrictions, physiological alterations, and taste perceptions in the CKD context. These findings underscore the importance of personalized dietary guidance that not only addresses the nutritional constraints imposed by CKD but also considers patients' preferences to foster a sustainable and satisfying dietary experience.

Table 3: Food preference of different food group

Food Group	CKD Group	Control Group
Rice/Bread	5.4 ± 1.97 [a]	7.23 ± 0.90 [b]
Red Meat	5.23 ± 1.869 [a]	6.9 ± 1.98 [b]
Poultry	5.46 ± 1.279 [a]	5. 03 ± 2.10 [a]
Fish	5.73 ± 1.68[a]	7.23 ± 1.56[b]
Leafy Vegetables	4.83 ± 1.70 [a]	7.36 ± 1.35 [b]
Vegetables	6.16 ± 1.39 [a]	7.33 ± 1.70 [b]
Pulses	5.93 ± 1.17 [a]	6.46 ± 1.50[b]
Egg	5.13 ± 1.73 [a]	6.13 ± 1.59 [b]
Milk	5.63 ± 1.49 [a]	6.6 ± 1.37 [b]
Milk Products	6.5 ± 1.52 [a]	6.96 ± 1.56 [a]
Fruits	6.1 ± 0.88 [a]	6.33 ± 1.62 [a]
Drink	7 .0± 0.58 [a]	6.3 ± 0.70 [b]
Sweets	7.03 ± 0.99 [a]	7.2 ± 1.42 [a]

Values are means with Standard deviation. Values in a row not sharing a common letter are significantly different at p _ 0.05.

CHAPTER 5

5.1 Conclusion

The pilot study established some facts such as CKD negatively affects appetite thus results in aversion to food in some cases. It was failed to established any clinically significance between CKD And food preferences. As the study was conducted on only 60 subjects therefore, further studies involving a large population sample is required to fully establish the findings of this study as facts.

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Annex 1:

Questionnaire

Questionnaire no: …….. Date:. ….

Food preference and aversion to food among patients with chronic kidney disease

1. Name:
2. Sex
3. Age:
4. Height:
5. Weight:
6. Address:
7. Hospital Name:
8. ward/Bed No:
6. Serum creatinine level (from biochemical test report):
7. Education level
8. Do you think your taste of food has changed after being affected with CKD? □Yes □No
9. How is your appetite? □ Poor □normal □good

Presence of food allergies: □Yes □No

Foods that cause allergies after consumption: _____

Times of meal taken per day: _____

Times of snack taken per day:_____

Extra salt consumption: □ Yes □No

Smoking: □Yes □No

Alcohol Consumption: □Yes□ No

Diabetes: Yes □No

Hypertension: □Yes □N

10. Rate the present preference of following food group

Food group	1 Dislike Extremely	2 Dislike Very much	3 Dislike Moderately	4 Dislike Slightly	5 Neither like nor dislike	6 Like slightly	7 Like moderately	8 Like Very Much	9 Like Extremely
Rice/roti									
Red meat									
Poultry									
Fish									
Leafy Vegetables									
Vegetables									
Pulses									
Egg									
Milk									
Milk product									
Sweet food									

Sour food									
Fried food									
Fruits									

Drinks								

11. Do you feel aversion to any food after being diagnosed with CKD? Yes/ No

12. If yes (11), for which of the following food groups do you feel aversion?

a. Rice/Roti
b. Meat
c. Poultry
d. Fish
e. Vegetables
f. Pulse
g. Milk
h. Milk Product
i. Drink
j. egg
k. sweet food

13. Do you restrict any food item after being diagnosed with CKD?

14. If yes (12), which of the following food groups do you restrict?

a. Rice/Roti
b. Meat
c. Poultry
d. Fish
e. Vegetables
f. Pulse
g. Milk
h. Milk Product
i. Drin
j. Egg
k. sweet food
l. Sour food

15. Family history of kidney disease? □ Yes □No

16. Swelling of feet and ankles? □Often □sometimes □Rarely □ not at all

17. How many glasses of water do you drink a day? _____

18. Have you been told you can't eat more salt? □Yes □No

Monthly family income:

□<10000

□10000 – 20000

□20000 – 30000

□≥30000

Monthly expenditure on food: □<3000

□3000 – 5000

□5000 – 8000

□ ≥8000

Religion

: □Islam □Hinduism □Christian□Buddhism

Profession

: _____

Living Condition: □Rural □Urban

Signature

Date: ……....

Questionnaire no: ……. Date:. ……

Food preference

1. Name:

2. Sex:

3. Age:

4. Height:

5. Weight:

6. Education level:

7. How is your appetite? □ poor □normal □good

Presence of food allergies: □Yes □No

Foods that cause allergies after consumption: _____

Times of meal taken per day: _____

Times of snack taken per day:_____

Extra salt consumption: □ Yes □No

Smoking: □Yes □No

Alcohol Consumption: □Yes □ No

Diabetes: Yes □No

Hypertension: □Yes □No

8. Rate the present preference of following food group

Food group	1 Dislike Extremely	2 Dislike Very much	3 Dislike Moderately	4 Dislike Slightly	5 Neither like nor dislike	6 Like slightly	7 Like moderately	8 Like Very Much	9 Like Extremely
Rice/ruti									
Red meat									
Poultry									
Fish									

Leafy Vegetables									
Vegetables									
Pulses									
Egg									
Milk									
Milk product									
Sweet food									
Sour food									
Fried food									
Fruits									
Drinks									

9. Family history of kidney disease? □ Yes □No

10. Swelling of feet and ankles? □Often □sometimes □Rarely □ Not at al

11. How many glasses of water do you drink a day?_____

12. Have you been told you can't eat more salt?□Yes □No

Monthly family income:

□<10000

□10000 – 20000

□20000 – 30000

□≥30000

Monthly expenditure on food: □<3000

□3000 – 5000

□5000 – 8000

□ ≥8000

Religion

: □Islam □Hinduism □Christian □Buddhism

Profession

: _____

Living Condition: □Rural □Urban

Signature

Date: ……....