



## Mathematical analysis of the effect of mixed diet of radish leaves on type II diabetic patients in Tiruvarur district

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### ABSTRACT

**Background:** Non-communicable diseases like diabetes mellitus 2, heart disease, chronic respiratory conditions, and brain disorders like stroke have caused a catastrophe in developing nations, particularly India, which has the world's second-largest population. Radishes have a place with the root vegetable family. Radishes are low in carbohydrates and high in antioxidants and fibre. Diabetes is one of the current lifestyle diseases. Radish leaves have many properties that help lower blood sugar levels.

**Methods:** To collect data from the selected samples, a well-organized interview schedule was created. Information was gathered utilizing interview strategy.

**Results:** Among the total 100 study population in the present study, there was a statistically significant difference before and after supplementation with radish leaves.

**Conclusion:** The purpose of this study was to determine how radish leaves affected type II (NIDDM) diabetic patients in a world moving toward natural foods. Studies have shown that people who consume radish leaves have significantly lower blood glucose levels.

**Keywords:** Diabetic, Radish leaves, Mathematical Analysis

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### Introduction

Diabetes mellitus type 2 (DM2) is defined as a multifactorial, heterogeneous, and autoimmune disorder of metabolism with multi-genetic involvement. The underlying pathogenesis of DM2 is a lack of insulin action on receptors and sometimes decreased insulin secretion. Glucose metabolism is mainly affected, which is reflected in persistently elevated

blood glucose levels, i.e. hyperglycemia. Ultimately, this leads to disturbances in protein and fat metabolism[1]. DM2 is characterized by multifactorial interactions between various environmental and genetic factors. Adult development encompasses changes in the biological and psychological domains of human life from the end of adolescence to the end of one's life[2]. It has emerged as one of the most common causes of morbidity and mortality worldwide. Diabetes and heart disease are two examples of long-term health issues that frequently strike adolescents. An even eating routine and actual work lower glucose and increment brain plasticity[3].

Greens can be eaten raw in salads, cooked in soups, pesto, and other dishes. like other vegetables with leaves. The root of the radish is also high in calcium, iron, and thiamin, making it six times more vitamin C-rich than spinach. Additionally, it is a good source of folic acid. Molybdenum contributes to the nervous system's development[5].

#### NUTRITION FACTS

Reference: Indian food's nutritional value. 2002. S no 100 (ref # 2). Values with \* see ref # 1

Nutrient	Nutrient Composition/100g (edible portion)
Leaves	
Moisture, g	91
Energy, Kcal	28
Protein, g	4
Fat, g	0
Carbohydrate, g	2
Fiber, g	1
Calcium, mg	265
Iron, mg	0
Phosphorus, mg	59

Radish leaves are a rich wellspring of calcium, iron and ascorbic corrosive and when eaten with rice, helps during the time spent calcification of bile. Potassium, which helps

maintain blood pressure, is abundant in this food. Radishes assist with building collagen, which reinforces veins and in this manner diminishes the gamble of atherosclerosis[4].

## **REVIEW OF LITERATURE**

Up to 7 million children and adults in the United States suffer from diabetes, a complicated condition that, in its advanced stages, can affect nearly every organ system. Diabetes mellitus is a nutritional condition characterized by urine glucose levels that are abnormally high. It results from a flat out or relative absence of insulin, which prompts irregularities of starch digestion as well as in the digestion of protein and fat. **(Dr.Bakhru.H.K.,2016)**

There were 72 million instances of diabetes in India for 2017. In 425 million individuals have diabetes in world. Tamil Nadu has the second most elevated rate of type 2 diabetes. Every year 7 million individuals have diabetes. **(Roglic.C.,2017)**

Diabetes was directly responsible for 1.5 million deaths in 2019. To present a more accurate picture of diabetes-related deaths, cardiovascular disease, chronic kidney disease, and tuberculosis deaths caused by elevated blood glucose should be included. Another 2.2 million people died from high blood glucose levels in 2012, the year for which data are available. A condition known as type II diabetes is characterized by excessively high blood glucose or sugar levels. a condition in which insulin-responsive cells malfunction. High glucose is harming the body and can cause other serious medical conditions, like coronary illness, vision misfortune and kidney infection. **(Srilakshmi.B.,2019)**

In patients with urinary infections, radish also reduces inflammation and burning maturation, or the burning sensation while passing urine. In cases of renal and urethral stones, radish leaves also assist in pushing these stones outside the body during urine passing by increasing urinary output. **(Falal M Aziz.,2020)**

The leaves of mooli, or radish, contain a lot of water and fiber. Radish has two benefits for treating constipation. The high water content of fiber not only facilitates easy movement and the secretion of digestive juices, but it also aids in the creation of bulk and the removal of waste by pushing it toward the anus. **(Divya Jacob.,2021)**

Radish leaves are exceptionally low in calories too furnish with a great deal of fiber, nutrients and cell reinforcements. Radish can be incorporate as a piece of salad or mid time nibbling

choice while an individual is on a weight reduction free, parcel of poisons are delivered in a body when fat cells are scorched. The high water content in radish helps hotel expanding pee. This will likewise helps in better weight reduction evacuation of collected poisons in the body. (Pallavi Suyog Uttekar., 2021)

## **METHODS**

The population of the Tiruvarur district in Tamil Nadu, India, was the subject of the present cross-sectional study. This region was chosen because of its easy accessibility and researchers were interested in studying the effect of Radish leaf powder as an adjunctive medicine in diabetic patients (NIDDM) in this region.

One hundred diabetic patients aged 41-45 years were collected and purposive sampling method was used as the study involved comprehensive data collection. The selected 20 subject samples were classified as middle-aged adults from Tiruvarur district to nearby area.

A) Evaluation of nutritional status of subjects before and after supplementation

- i. Anthropometric measurement
- ii. Biochemical assessment
- iii. Clinical assessment
- iv. Diet Survey

B) Analysis and interpretation of data

## **RESULTS**

Out of the complete 100 review populace in the current review, 35% of diabetic subjects were between 42-43 years old, 27% were 43-44 years old, 21% were 44-45 years old and 17% of subjects were 41-42 years old.

In the analysis of gender distribution, 55% of the subjects were male and 45% female.

At the time of analysis, 92% of the subjects were married and 8% of the subjects were unmarried, 69% of the subjects were literate and 31% were illiterate, 63 %of the subjects were nuclear family and 37 % of the subjects were joint family, 59% of the subjects were employed and 41% were unemployed, 37% of the subjects were walking, 5% jogging, 16% yoga, 12% cycling, and 31% did no exercise, 24% of the subjects worked for 6-7 hours, 64% of the subjects for 7-8 hours and 12 % of the subjects for more than 9 hours, 60%of the subjects rested for 3-4 hours a day, 35% for 2-3 hours and 5% for 4 hours, 75% are non-smokers and 25% are smokers, 42% had no family members with diabetes, 20% had diabetes from their father, 21% from their mother, 10% from their parents, and 7% from their grandparents.

In this study, 30% had diabetes duration of 3-4 years, 23% had diabetes for 2-3 years, 29% had diabetes duration of more than 4 years and 18% had diabetes for 1-2 years, 63% of the subjects were very hungry, 26% of the subjects had a good appetite, 7% of the subjects were moderately hungry, and 2 % of the subjects were anorexic, 77% know about diabetes and 33% don't, 56% of the subjects had a routine medical examination and 44% had an informal medical examination. 51% had medical check up once a month and 32% twice a month. At one month, 5% of subjects underwent clinical examination once a week, and 2% of subjects underwent clinical examination rarely, 52% had high blood pressure, 20% had hypercholesterolemia, 15% had heart disease and 13% had kidney disease.

In the analysis of possible symptoms of the subjects, 43% of the subjects had polyuria, 30% had polydipsia, 19% had polyphagia, and 8% had weight loss, Subjects had other problems, 39% had swollen feet and legs, 26% had sores that didn't heal, 25% had none, and 10% had sweating.

**Complications Among the Subjects:**

36% of subjects had nephropathy, 27% had neuropathy, 21% had angioplasty, and 16% had no other complications.

**Malnutrition of subjects :**

52% were obese, 40% were normal, and 8% were underweight.

**Control of blood glucose in subjects:**

For blood sugar control, 82% with medication, 8% with diet, 6% with something, and 4% with exercise.

**BIOCHEMICAL ASSESSMENT OF THE SUBJECTS**

**Table 1: Assessment of blood sugar before and after a mixed diet of radish leaves in a study population**

S.NO.	BEFORE SUPPLEMENTATION		AFTER SUPPLEMENTATION	
	FBS(mg/DL)	PPBS(mg/DL)	FBS(mg/DL)	PPBS(mg/DL)
1	165	232	112	170
2	215	328	148	202
3	108	192	85	132
4	127	212	99	152
5	118	192	95	148
6	312	465	152	275
7	119	195	108	152
8	199	302	129	205
9	118	202	95	156

10	292	415	185	268
11	115	252	105	172
12	275	402	125	218
13	145	228	125	192
14	265	392	148	265
15	199	308	119	210
16	172	255	98	168
17	235	382	92	135
18	165	332	148	235
19	115	188	96	149
20	132	218	112	170

### Test of Paired Samples (t)

### Hypotheses

There are two mathematically equivalent ways to express the hypotheses, both of which convey the same concept:

$H_0: \mu_1 = \mu_2$  ("the paired population means are equal")

$H_1: \mu_1 \neq \mu_2$  ("the paired population means are not equal")

Where

- $\mu_1$  is the population mean of variable 1, and
- $\mu_2$  is the population mean of variable 2.

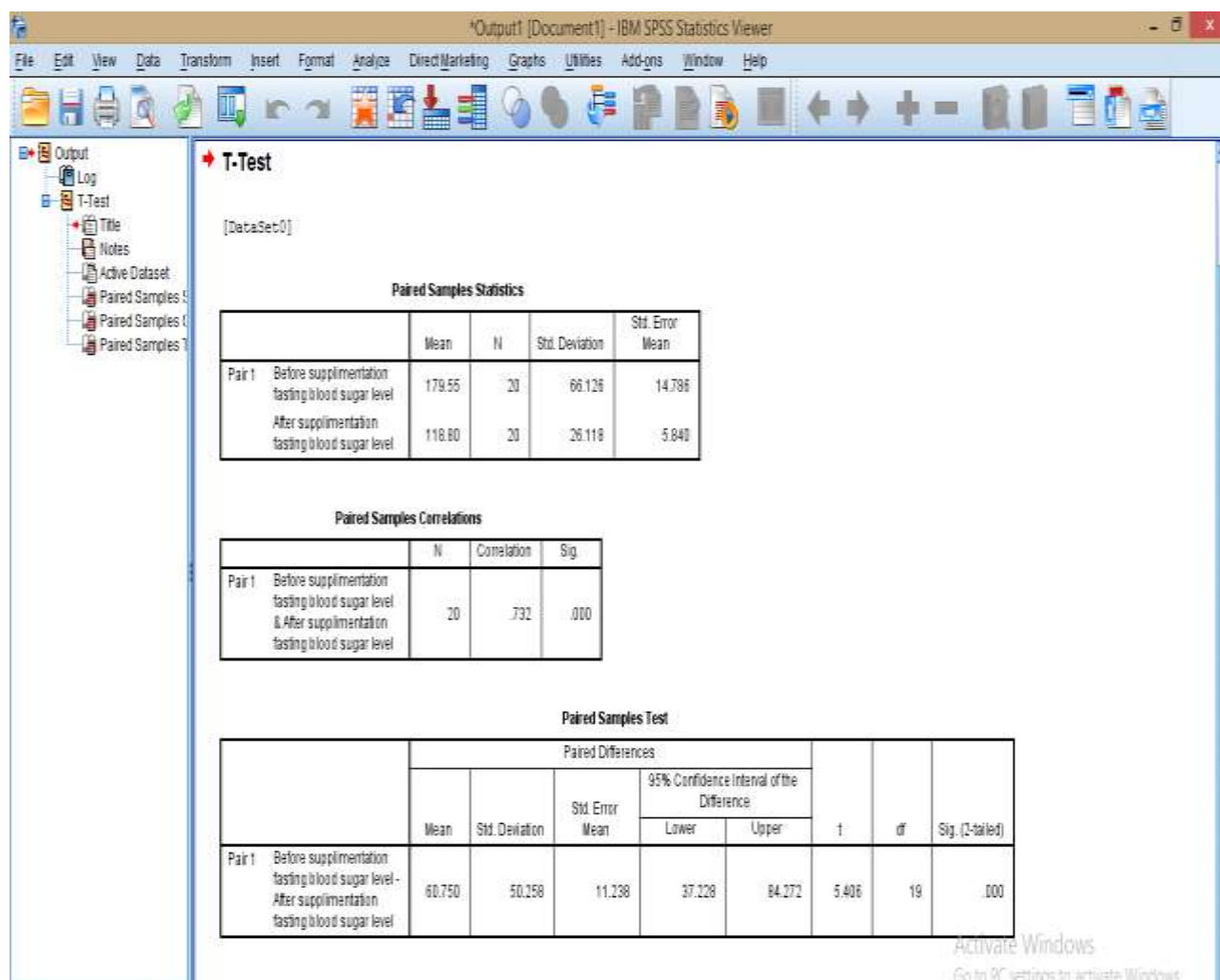
$$\text{The Statistic : } t = \frac{\mu_x - \mu_y}{\sqrt{S^2 \left( \frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

$$\text{Where } S^2 = \frac{1}{n_1 + n_2 - 2} [\Sigma(x - \bar{x})^2 + (y - \bar{y})^2]$$

### Mathematical analysis of fasting blood sugar levels before and after a radish leaf mixture meal in a study population using SPSS package

Null Hypothesis,  $H_0 : \mu_x = \mu_y$ , there is no significant difference between the fasting blood sugar levels before and after a radish leaf mixture meal.

Alternative hypothesis  $H_1 : \mu_x \neq \mu_y$  (two – tailed).



P – Value(Sig 2 – tailed) = 0

0 < .05, So the null hypothesis can be rejected

### DECISION AND CONCLUSIONS

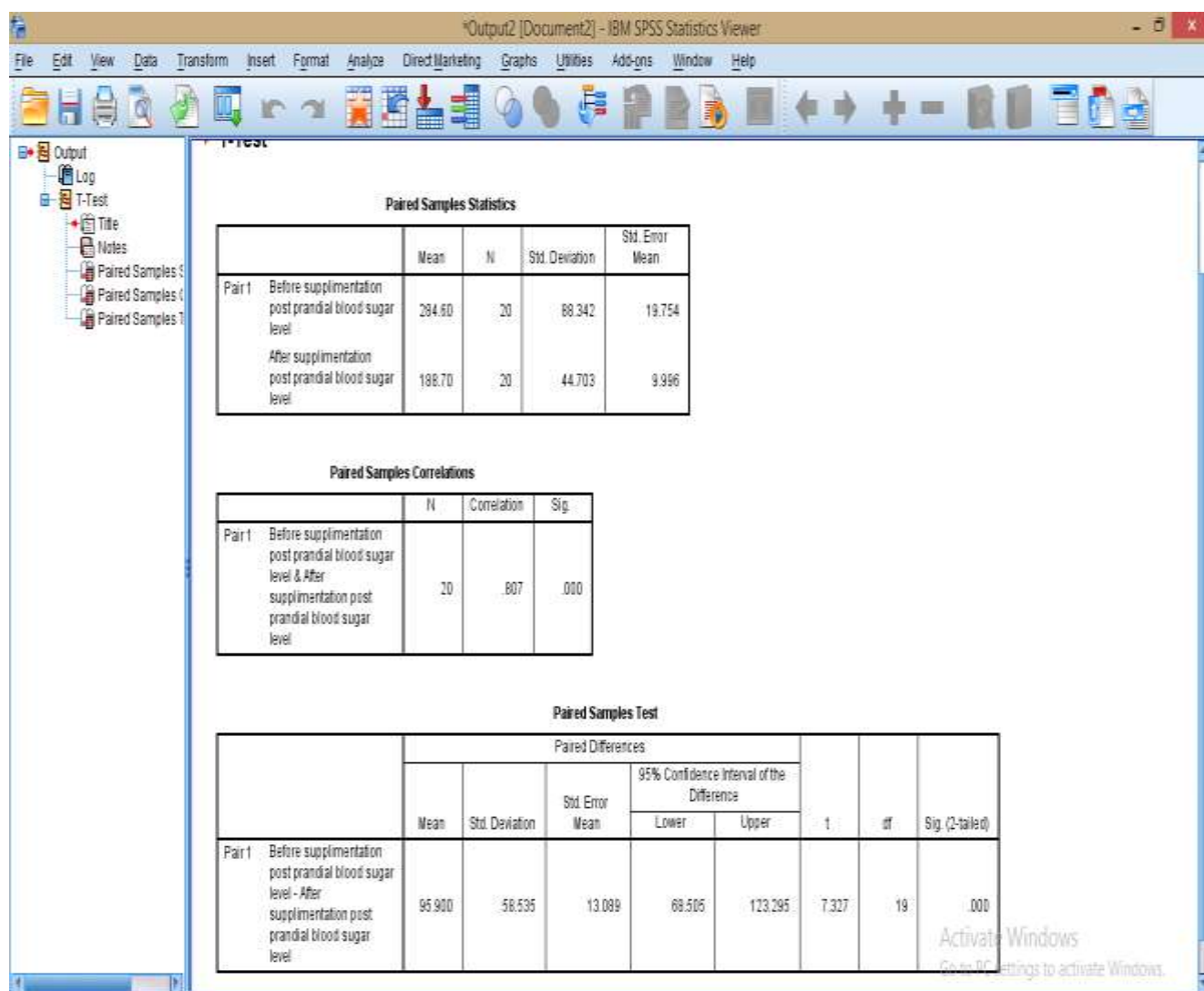
From the results, we can say that:

- A positive correlation was found between the radish leaf mixture meal and fasting blood sugar levels. ( $r = 0.732, p < 0.05$ ).
- Before and after eating a meal with radish leaf mixture, the average fasting blood sugar levels differed significantly. ( $t_{19} = 5.406, p < 0.05$ ).
- On average, fasting blood sugar levels before radish leaf mixture meal 167.75 points higher than fasting blood sugar levels after a radish leaf mixture meal (95% CI [37.228, 84.272]).

**Mathematical analysis of post prandial blood sugar levels before and after a radish leaf mixture meal in a study population using SPSS package**

Null Hypothesis,  $H_0 : \mu_x = \mu_y$ , The postprandial blood sugar levels before and after a meal of radish leaf mixture are not significantly different.

Alternative hypothesis  $H_1 : \mu_x \neq \mu_y$  (two – tailed).



P – Value(Sig 2 – tailed) = 0

0 < .05 so the null hypothesis can be rejected



## **DECISION AND CONCLUSIONS**

From the results, we can say that:

- Numerical examination of post prandial glucose levels when a radish leaf blend dinner emphatically related ( $r = 0.807, p < 0.05$ ).
- There was a critical typical distinction between post prandial glucose levels when a radish leaf blend feast ( $t_{19} = 7.327, p < 0.05$ ).
- On average, post prandial blood sugar levels before radish leaf mixture meal 95.9 points higher than post prandial blood sugar levels after a radish leaf mixture meal (95% CI [68.505, 123.295]).

### **Conclusion:**

Momentum research shows that radish leaves are plentiful in fundamental nutrients and minerals, fabricate safe cells and forestall persistent illness and produce supplements that capably affect the body. This study was conducted to determine the impact of radish leaves on type II (NIDDM) diabetic patients as the world moves toward natural products. The review showed that the blood glucose level diminished essentially in the people who utilized radish leaf powder.

Protein, dietary fiber, vitamin C, sodium, and potassium are just some of the nutrients found in radish leaf powder chapatti. Additionally, it lowers diabetics' blood sugar levels. Radish leaves are advantageous, less conservative and one of the most famous and generally considered ways of bringing down glucose and pulse levels in diabetic patients.

As a result, diabetes is a major issue. The purpose of this study was to assess the quality of value-added radish leaf powder, which primarily aids diabetes patients.

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