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# An Overview of *Musa paradisiacal* Flour-meal Nutritional Prospect for Immune System Improvement against Covid-19 Complications in Diabetes Patients

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## Abstract

Patients with diabetes coexisting with COVID-19 show a high mortality risk and severe complications for the reason that the COVID-19 disease and the diabetes mellitus health condition combine to induce a lower immune system and consequent organ failure fatalities. While a cure has not yet been found for COVID-19, studies have shown that diets that low glycemic index, fiber-rich diet exhibit beneficial effects on improving health conditions in diabetes patients. In this paper, therefore, the nutritional prospects of *Musa paradisiacal* (*M. paradisiacal*: plantain) flour-meal for immune system improvement that could be against COVID-19 complications in diabetes patients have been studied. For this, the study elucidates how the essential nutrients in *M. paradisiacal* could help boost the immune system in diabetes patients that may be living with and without the COVID-19 virus infection. The detailed prospects of nutritional benefits that could be accrued from *Musa paradisiacal*, therefore, and the attendant health condition improvements, that could essentially reduce risks of COVID-19 complications support the use of the flour-meal for patients living with diabetes.

**Keywords:** Plantain meal, diabetes mellitus, and COVID-19, hyperglycemia

## 1. Introduction

Scientific evidence reveal diabetes mellitus as one of the major challenges facing the human race today. The prevalence of diabetes mellitus has characterized it to be one of the major non-



communicable and fast-spreading disease in the world [1]. Diabetes mellitus has become a challenge of serious magnitude and health concern with data obtained from many countries indicating that not less than 10% of the population age 20 and above are affected by the disease [2]. A disease distinguished by hyperglycemia as a causative effect of a group of metabolic diseases resulting from total or partial damages of particular pancreatic cells in the human body insulin synthesis [3]. It is a disease caused by increased blood sugar index over a long period of non-treatment resulting in frequent urination, increased hunger, and increased thirst. On the major, it occurs as a result of unproductive of enough insulin by the pancreas or the unresponsiveness of the body cell to the produced insulin [4-6]. Patients with diabetes mellitus are prone to several debilitating health infections and complications ranging from the disordered humoral immune system, Neutrophil dysfunction, bacterial and viral respiratory tract infections, pneumonia, cardiovascular disease, peripheral vascular disease, nephropathy, retina changes and blindness, physical disability and which may often lead to death [1,7].

COVID-19 has been an evolving and fast-spreading pandemic in the world today. As the world is fighting against the deadly virus (COVID-19) which was scientifically proven to be the causative phenomenon of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [8], the virus which is highly infectious through respiratory secretions, gaining access into the upper respiratory tract through the mucus membranes and advances to affecting the lungs. Literature reveals COVID-19 to be a mild illness in some cases while others develop intense complications of the respiratory system; less than 30 breaths per minute,  $PaO_2: FiO_2$ ; less than 300, blood oxygen saturation; less than/equal to 93%, and pulmonary infiltrates; greater than 50%. An average patient shows developed severe symptoms and complications with multi-organ failure and or septic shock, while less than 5% is associated with critical issues and if not over-estimated [7].

The spread of the novel coronavirus has reached a global widespread with high rise morbidity and mortality rate in diabetes mellitus patients. The prevalence of a high increase of diabetes in the globe is a great challenge for the health organizations which poses greater threats as the COVID-19 advances. A report from a conducted experiment [8] showed that, from the sample space of 1099 showing signs of COVID-19 infection, 16.2% exhibit someexistence of severe

disease comorbidity of diabetes mellitus. Also, from 140 COVID-19 sampled cases, 12% had diabetes. Research shows that patients with diabetes stand more risk of severe complications and high mortality rates if infected with COVID-19 [4] as diabetes proves to increase the morbidity and mortality rate [2]. It was indicated in [15] that the incidence of diabetes in COVID-19 patients is double-fold compared to patients with non-diabetes and also, individuals with diabetes mellitus are susceptible to several infections. The safe brokenness found in patients with diabetes mellitus are functions of several factors, some of which include; T-cell mediated immune responses, hyperglycemia, altered cytokine production, phagocytic, among others. The reported work in [9] confirmed that diabetes patient coexisting with COVID-19 have higher pro-inflammatory cytokines with critical survival rate compared to non-diabetes patients.

Literature does not only reveal that the presence of diabetes poses no causative effect for COVID-19 infection but may increase the severity of complications in patients coexisting with diabetes and also makes diabetes patients susceptible to COVID-19 infection [7]. However, since the survivors of COVID-19 and diabetes was not much compared to the non-survivors hence, patients with diabetes mellitus and COVID-19 have high mortality rate due to lower lymphocyte count, increased white cell and neutrophil ratio [9] while the few troopers of COVID-19 combining diabetes mellitus exhibits a substantial amount of overall glycated hemoglobin.

It is pertinent to note that some of the clinical highlights and recommendations for patients with diabetes were suggested for better health conditions, while the world still lives with the virus with the potential lack of a cure for both diabetes mellitus and the COVID-19. Some of these recommendations include:

- (a) Blood glucose control must be seen as a necessity for patients with diabetes.
- (b) Maintaining a good, regular healthy, and offset diet with a great measure of protein, fiber, and reduction of fats consumption.
- (c) Keep a good glycemic control
- (d) Regular exercise.
- (e) Minimize exposure to COVID-19.

The spread of the virus has reached its peak in infected regions with high rate morbidity and mortality manifesting in aged persons and patients with diabetes mellitus. Research shows that diabetes mellitus patients are prone and susceptible to COVID-19 with an expanded danger of

complexities which may eventually result in death [4]. It was concluded in [9] that diabetes mellitus patients with COVID-19 infection have greater mortality, display chronic and serious inflammatory reactions making them liable to get mechanical aide such as ventilation. Also, studies show that diabetes patients and related comorbidities have increased risk with poor outcomes which may eventually lead to death [2,8,10]. The susceptibility of patients with diabetes mellitus to coronavirus has been considered a crucial concern for public health administrators. Presently, diabetes mellitus and COVID-19 have no known cure but can both be managed successfully. A pre-infection health management program can be helpful as the possibility of surviving the virus having been infected is low if not impossible.

Genetic susceptibility with surrounding influences such as poor diethas been proven to be a major factor enhancing the development of diabetes mellitus conditions and has been proved by researchers to be modifiable and preventable [1,11,12], consequently, nutritional therapy is an integral aspect of preventing and management of diabetes. This is effective in other to aid and maintain the quality of life and nutritional health, and also to prevent or treat severe and acute or long-term complications of diabetes [13]. The objectives of the nutritional therapy of diabetes mellitus are to:

- Improve health nutrition by a balanced diet
- Provide energy reasonable for weight, normal growth, and development.
- To maintain and regulate blood sugar level
- Achieve the required blood lipids level
- Prevent delay of diabetes-related complications and treat such
- To boost and maintain the immune system

*M. paradisiacal* contains nutrients which help in achieving the objectives of the nutritional therapy for diabetes mellitus. However, other Foods such as; oatmeal, high fiber content food, wheat meal, fruits, vegetables, fish, roots, eggs, and nuts can also be helpful while avoiding dairy products, refined fats, sugar, alcohol, and salts.

This discuss enumerates thenutritional benefits that could be accrued from *Musa paradisiacal*, thereof, and the attendant health condition improvements, that could essentially reduce risks of COVID-19 complications support the use of the flour-meal for patients living with diabetes.

## **2. Plantain: Economic and Social Impact**

Plantain (*Musa paradisiacal*) remains one of the most starchy foods and a plant producing which can be processed before consuming or taken raw [14]. Plantain is developed over 100 nations not barring the torrid and the temperate regions with an annual production rate of over 97 million tonnes [15]. Being one of the most consumed food crops in the tropics, plantain is ranked third after cassava and yam. Plantain consumption in Nigeria has increased tremendously over the years and record shows Nigeria as one of the highest producers of plantain in the world, and with its prominence still not considered as export due to urbanization and increase in demand for easy and convenient food [16-17]

The post-harvest losses of plantain have subjected it to early processing which tends to preserve the food's edibility and freshness to an extent [16]. Being a seasonal fruit with a high increase in consumption rate all through the year, plantain is processed into various forms due to its perishable nature with short shelf-life, some of which includes; plantain chips, roasted plantain (booli), plantain flour, plantain beer, etc. [18-19] which can be stored or refrigerated until the need arises. Plantain is peeled and boiled in water for 15 to 45 minutes depending on the post-harvest nature of the cultivar and also the ripening state and consumed alongside with any sauce of choice. It is also turned into the pastry to make different delicacies.

Several people around the globe depend on plantain not only for food but also as a health remedy and others as a source of income [20]. Apart from being a major staple, plantain is enriched in nutrients with vast medicinal benefits which makes it a daily recommended meal for patients with diabetes mellitus, tonsillitis, sore throat, colitis, etc. making it a clinical prescription for patients as well [17,20].

## 2.1 Nutritional Value and health benefits of plantain

Plantain (*Musa paradisiacal*) is enriched with lots of active natural nutrients [21] these includes;

- **Vitamins:** It is an excellent source of vitamins that help increase human focus and brain sharpness. Plantain is highly rich in vitamins A, 37.5% which act as an antioxidant, maintain healthy mucus membranes, enhance the skin complexion and also play an important role in the visual system; vitamin B-complex this helps fight against germs and aid the treatment of anemia, and neuritis, and also reduces homocysteine: a major contributor of the coronary disease. Vitamin C, 31%; this helps the body to fight against stroke and develops resistance against germs and infection-carrying agents in the body

[22]. To sum up the vitamin level in plantain, it contains a moderate amount of thiamin, folates, riboflavin, and niacin.

- **Potassium:** Plantain is enriched with potassium; 10.6% (499mg) which helps prevent muscular spasms, an important element that helps control and regulates the blood pressure by opposing the effect of sodium and overall improvement of the kidney.
- **Iron:** This helps to build blood
- **Magnesium:** This is essential for bone development and also give cardioprotection. An average plantain contains 37mg of magnesium.
- **Phosphorous:** Apart from the formation of bone and teeth, phosphorous plays a major role in how the body system uses carbohydrates and fats.
- **Energy:** Plantain has a weight content of about 122 calories and a very substantial amount of energy enough to sustain and supplement a human daily diet.
- **Dietary fiber:** The dietary fiber constituent found in plantain measures up to 6% i.e. 100g which helps normal bowel movement and hence reduces problems of costiveness. Table 1 shows a detailed analysis of the nutritional values of plantain.
- **Protein:** It helps in cell formation, growth, maintenance, and the regulation of body tissues and organs. The total amount of protein present in plantain/100g is 1.30g i.e. 2%. Table 1 shows a summary of the nutritional value of *M. paradisiacal* per 100g.

## 2.2 Medicinal Benefits of Plantain.

Plantain is extremely rich in healthy constituents and nutritious containing large essential nutrient which benefits the digestive system, weight loss, and heart health. To mention a few, some of the health benefits of plantain includes; Aiding the retention of calcium, nitrogen, and phosphorus which all work in building healthy and regenerated tissues, good for wounds and burns, it helps in neutralizing the acidity of gastric juices to reduce the irritation of the stomach, it promotes healing in ulcer patients by serving as laxatives, helps in fighting intestinal issues and disorders such as ulcers, reduces hangover, serves as an energy booster, effective immune booster, it aids constipation, it is used in the treatment of anemia, it is used in the treatment of arthritis, reduces the risk of high blood pressure, restore normal bowel activity, reduce the risk of stroke, it helps boost brainpower, cholesterol-lowering effect, improves kidney health, protects against Alzheimer's disease.

Table 1: Nutritional value of Plantains (*Musa paradisiacal*), (Source: [23])

PRINCIPLE	NUTRIENT VALUE	PERCENTAGE
Energy	122Kcal	6%
Zinc	0.14mg	1%
Vitamin k	0.7µg	1%
Vitamin E	0.14mg	1%
Vitamin C	18.4MG	31%
Vitamin A	1127 IU	37.50%
Total fat	0.37g	2%
Thiamin	0.052MG	4%
Sodium	4Mg	<1%
Riboflavin	0.054mg	4%
Pyridoxine	0.299mg	23%
Protein	1.30g	2%
Potassium	499mg	10.60%
Phosphorous	34mg	5%
Niacin	0.686mg	4%
Magnesium	37mg	9.00%
Iron	0.60mg	7.50%
Folates	22µg	5.50%
Dietary fiber	2.30g	6%
Cholesterol	0mg	0%
Carbohydrates	31.89g	24.50%
Calcium	3MG	<0.5%

### 3. Essentials of Plantain flour meal

Plantain is a natural fruit with lots of health and medicinal benefits which helps fight against several unwanted materials in the body system. Sequel to the vast benefits of plantain, it is recommended as part of a daily diet for diabetes patients because it contains the essential nutrients needed for a daily diet. The essentials of plantain nutrients for patients with diabetes cannot be dusted. The disease is not known to have any cure but managing it will help the patient go a long way. By keeping to a good and healthy diet, a patient with diabetes is sure of healthy living. Plantain contains all the needed dietary composition to maintain and regulate the disease. This helps keep the blood sugar level of the patient. Raw consumption of plantain gives a whole nutrient and research shows that mashed plantain contains more of the whole nutrient. For a diabetes patient, consuming plantain as a meal will be helpful while living with the COVID-19



also, patients with diabetes being susceptible to the virus possess a greater risk of unwholesomeness and fatality.

#### 4. Conclusions

COVID-19 is still ongoing and rapidly evolving posing threats not only to the human lives, but also socio-economic, private, and professional lives as well as a lack of potential cure and vaccines. The world undoubtedly through Governments and health organizations admits with precautions to live with the virus until a probable cure is known and made available for both infected and non-infected individuals. It is of great concern to the coordinated public health administrators as patients with diabetes mellitus stand a greater risk of morbidity and mortality amidst the whole pandemic discordance. Hence, nutritional therapy aiding as a potential health mechanism which helps to boost the immune system is recommended for patients while avoiding getting infected with COVID-19. The consumption of plantain as a meal will not only help to boost the immune system but also to regulate the glycemic level of the system via balanced diet supplements accrued to plantain. This is however not a cure for the virus but a precautionary health mechanism for diabetes mellitus patients whilst living with the pandemic. Strict compliance with health laws to stay safe from COVID-19 infections should be adhered to.

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