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Efficiency of *Aloe vera* juice on diabetes mellitus: An interventional study

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Abstract

Diabetes is a chronic, metabolic disease characterized by elevated levels of blood glucose which leads over time to serious damage to the heart, blood vessels, eyes, kidneys and nerves. World Health Organization (WHO) defined About 422 million people worldwide have diabetes, the majority living in low-and middle-income countries, and 1.6 million deaths are directly attributed to diabetes each year. *Aloe vera* juice is used as a non-pharmacological approach in order to reduce blood glucose level. The present study aims to assess the effectiveness of *Aloe vera* juice on blood glucose level among Diabetes Mellitus Patients. A quantitative quasi-experimental research design was conducted among 30 Diabetes Mellitus Patients. Purposive sampling technique was used to select samples. Semi-structured interview was used to collect demographic data and Accu check Glucometer was used to assess the blood glucose level. The experimental group was given *Aloe vera* juice for one week. After one week, the blood glucose level was re-assessed. The study depicts that the posttest mean score of blood glucose level in the experimental group was 110.93 with standard deviation 12.48 and the posttest mean score of blood glucose level in the control group was 175.60 with standard deviation 48.05. The calculated student independent 't' test value of $t = 5.044$ was found to be statistically significant at $p < 0.001$ level. This clearly infers that there was significant improvement was observed in the post test level of blood glucose level among Diabetes Mellitus patients in the experimental group which clearly indicates that *Aloe vera* was found to be effective in reducing blood glucose level among Diabetes Mellitus patients in the experimental group than the control group.

Keywords: diabetes mellitus, hyperglycemia, blood glucose and *Aloe vera* juice

1. Introduction

Diabetes Mellitus is the worldwide problem nowadays most of the people suffering from diabetes. This is the Seventh leading cause of death in most of the developing countries. Diabetes is the group of the metabolic disorder. This is characterized by the high blood glucose level for prolonged period of time hyperglycemia due to poor life style habits. Type 1 Diabetes Mellitus present in children and adolescents, type 2 Diabetes Mellitus thought to be affect the middle- aged group. Pathogenesis of type 1 and type 2 Diabetes Mellitus drastically different and therefore each type has various etiologies presentations and treatments ^[1].

The global diabetes prevalence in 2019 is estimated to be 9.3% (436 million people) rising to 10.2% (578 million) by 2030 and 10.9% (700 million) by 2045. the most of prevalence in urban (10.8%) than rural (7.2%) areas and high-income (10.4%) than low income countries (0.4%) the number of people with diabetes increasing due to population growth, ageing urbanization, and Increasing prevalence of obesity and physical activity. According to WHO the world wide prevention of Diabetes Mellitus in India 72.96 million cases in diabetes in adult population the prevalence of urban areas at the range between 10.9% and 14.2% and prevalence in rural areas in India was 3.0- 7.8% among population aged 20 years and above with much higher prevalence among individuated aged over 50 years. 6.1 million Deaths are directly attributed to diabetes each year both the number of cases and the prevalence of diabetes have been steadily increasing over the past few decades ^[2].

India has the world second largest number of individuals living with Diabetes Mellitus. Life style changes as been proven to be an effective means by which reduce risk of type 2 diabetes prevention trails have been undertaken in high income countries. Type2 diabetes is extremely common problem in Indian population 700 million people were suffering and to control their blood glucose level. Diabetes it is the riddled with complications the primary way to manage the type 2 Diabetes Mellitus good diet and exercise program. The global prevalence of diabetes among adult over 18 years of age 4.7 in 1986. china was the most diabetes patients living country in world wide and 8.4% in 2014 between 2000 and 2016 there was a 5% increase the premature mortality from diabetes. Prevalence has been rising more rapidly in low and middle-income countries ^[3].

If the concentration of glucose in the blood exceeds the renal threshold for glucose, usually 180 to 200mg/dL (9.9 to 11.1mmol/L), the kidneys may not reabsorb all of the filtered glucose, the glucose then appears in the urine, it is accompanied by excessive loss of fluids and electrolytes. This is called osmotic diuresis. Because insulin normally inhibits glycogenolysis (break down of stored glucose) and gluconeogenesis (production of new glucose from amino acids and other substance), these processes occur in an unrestrained fashion in people with insulin deficiency and contribute further to hyperglycemia. In addition, fat breakdown occurs, resulting in an increased production of ketone bodies, a highly acidic substance formed when the liver breaks down free fatty acids in the absence of insulin [4]. Type 2 diabetes affects approximately 95% of adults with the disease. It occurs more commonly among people who are older than 30 years of age and obese, although its incidence is rapidly increasing in younger people because of the growing epidemic of obesity in children, adolescents, and young adults. The two main problems related to insulin in type 2 diabetes are insulin resistance and impaired insulin secretion. Insulin resistance refers to decreased tissue sensitivity to insulin. Normally, insulin binds to special receptors on cell surfaces and initiates a series of reactions involved in glucose metabolism [5].

Carbohydrate counting is a nutritional tool used for blood glucose management because carbohydrates are the main nutrients in food that influence blood glucose levels. While carbohydrate counting is commonly used for blood glucose management with type 1 and type 2 Diabetes, it is not a perfect. All the carbohydrates affect the blood glucose level to different degrees, regardless of size [6].

Diabetes is a group of metabolic diseases characterized by increased levels of glucose in the blood (hyperglycemia) resulting from defects in insulin secretion, insulin action, or both known as diabetes mellitus but now more commonly referred to as diabetes, requires an understanding, medical and nursing care, and rehabilitation of patients with diabetes [7]. Nurses care for patients with diabetes in all settings. Glucose derived from food cannot be stored in the liver but instead remains in the bloodstream and contributes to postprandial (after meals) hyperglycemia [8].

The diabetes mellitus metabolic syndrome is the cluster of conditions that occur together, increasing the risk of heart disease, stroke, and type 2 Diabetes Mellitus. These conditions include increasing blood pressure, high blood sugar, excess body fat around the waist, and abnormal cholesterol or triglyceride levels [9].

Aloe vera is a plant that has been used as a natural herbal medicine for many years. It is most known for treating sunburn, however, this succulent plant may have many other benefits for people with medical conditions including those with diabetes mellitus [10]. The effect of *Aloe vera* on diabetes glucose lowering effect on those that have type 2 diabetes patients can drink the juice from the plant or taken an *Aloe vera* capsule to help stimulate the secretion of insulin [11].

The purpose of the study is to assess the blood glucose level among Diabetes Mellitus patients in experimental and control

group, 2. to assess the effectiveness of *Aloe vera* juice on diabetes mellitus patients in experimental and control group and 3. to associate the effectiveness of *Aloe vera* juice on blood glucose level with the demographic variables among Diabetes Mellitus patients in experimental group.

2. Methods and Materials

A quantitative approach with quasi-experimental research design was used to conduct the study in Mappedu village in Thiruvallur District. 30 samples were selected by using a purposive sampling technique. The criteria for sample selection were diabetes mellitus patients' blood glucose level 180mg/dL to 250 mg/dL patients who are living in Mappedu village willing to participate in the study. The exclusion criteria for the samples are diabetes patients who are all taking hypoglycemia agents, persons who are all taking corticosteroids. Persons who have systemic diseases apart from diabetes mellitus, diabetes mellitus patients who have complications of diabetes mellitus like diabetic neuropathy, diabetic neuropathy, and diabetic retinopathy. The data collection period was done with prior permission from the village head. The purpose of the study was explained to the samples and written informed consent was obtained from them. The demographic data were collected using a semi-structured interview questionnaire, and the blood glucose level was assessed using a sliding scale. The blood glucose level was assessed before *Aloe vera* juice among both the control and experimental group. Then diabetes mellitus patients in the experimental group were given the *Aloe vera* juice. After 7 days, the blood glucose level was re-assessed among both experimental and control groups. The data were analyzed using descriptive and inferential statistics. The sample characteristics were described using frequency and percentage. Pearson's co-relation coefficient was used to assess the effectiveness of *Aloe vera* juice in the experimental group. Chi-square was used to associate the post-test level of blood glucose with the selected demographic variables.

3. Results and Discussion

3.1 Section A: Sample characteristics

Among 30 samples, 15 samples belong to the diabetes mellitus patients in the experimental group, 9(60%) were aged between 40–50 years and were male, 8(53.3%) were Hindus, 7(46.7%) had high school education, 9(60%) were moderate workers, 11(73.3%) had an income of below 10,000, 15(100%) were married, 14(93.3%) were non-vegetarian, 9(60%) had Diabetes Mellitus for 1–3 years and 13(86.7%) had a family history of Diabetes Mellitus. Most of the Diabetes Mellitus patients in the control group, 7(46.7%) were aged between 51–60 years, 9(60%) were male, 10(66.7%) were Hindus, 7(46.7%) had high school education, 9(60%) were moderate workers, 7(46.7%) had an income of below 10,000, 15(100%) were married, 11(73.3%) were non-vegetarian, 7(46.7%) had Diabetes Mellitus for 4–6 years and 12(80%) had a family history of Diabetes Mellitus.

Section B: Assessment of level of blood glucose among Diabetes Mellitus patients.

Table 1: Frequency and percentage distribution of pretest and posttest level of blood glucose among diabetes mellitus patients in the experimental and control group n = 30(15+15)

Group	Blood Glucose	Normal <100mg/dl		Pre-Diabetes (100=125)mg/d		Diabetes >126mg/gl	
		No.	%	No.	%	No.	%
Experimental Group	Pretest	0	0	1	6.67	14	93.33
	Posttest	5	33.33	8	53.33	2	13.33
Control Group	Pretest	0	0	2	13.33	14	86.67
	Posttest	0	0	2	13.33	14	86.67

The above table 1 shows that in the pretest of experimental group, 14(93.33%) had diabetes and 1(6.67%) had pre-diabetes whereas in the post test 8(53.33%) had pre-diabetes, 5(33.33%) were normal and 2(13.33%) had diabetes. Whereas in the pretest of control group, 14(86.67%) had diabetes and 2(13.33%) had pre-diabetes whereas in the posttest 14(86.67%) had diabetes and 2(13.33%) had pre-diabetes.

The present study findings is supported by Jubee Joseph *et al.*, (2018) conducted a study to assess the Effect of *Aloe vera* Juice on Glucose Level among Diabetics in a Selected Old Age Home at Mangalore. The paired “t” test was used to compare the effect of *Aloe vera* juice on blood glucose level within the groups. The t calculated value is (t cal = 2.998 and 2.76) greater than the t table value[t (24,0.05)= 2.02] and the corresponding p values were [(0.007 and < 0.05] which shows that there is a difference in blood glucose level before and after the intervention of *Aloe vera* at 5% level of significance [12].

Section C: Effectiveness of *Aloe vera* juice on blood glucose level among Diabetes Mellitus patients in experimental group.

Table 2: Effectiveness of *Aloe vera* juice on blood glucose level among diabetes mellitus patients in the experimental group. n = 15

Blood Glucose	Mean	S.D	Paired‘t’ test Value
Pretest	167.73	36.41	t=7.114 p=0.0001 S***
Posttest	110.93	12.48	

The table 2 depicts that the pretest mean score of blood glucose level was 167.83 with standard deviation 36.41 and the posttest mean score of blood glucose level was 110.93 with standard deviation 12.48. The calculated paired‘t’ test value of t = 7.114 was found to be statistically highly significant at $p < 0.001$ level. This clearly infers that there was significant improvement was observed in the post test level of blood glucose level among diabetes mellitus patients in the experimental group which clearly indicates that *Aloe vera* was found to be effective in reducing the blood glucose level among diabetes mellitus patients.

The present study was supported Choudhary M, Kochhar A, Sangha J. (2014) conducted a study to assess the Hypoglycemic and hypolipidemic effect of *Aloe vera* L. in non-insulin dependent diabetics. The results depicts that there was a significant ($p \leq 0.01$) reduction in fasting blood glucose level by 11.4% and 15.4% and post prandial glucose level 18.5% and 27.8% in the subjects of group II and III respectively after the study [13].

The present study was supported Alinejad-Mofrad S, Foadoddini M, Saadatjoo SA, Shayesteh M. (2015) conducted a study to assess the Improvement of glucose and lipid profile status with *Aloe vera* in pre-diabetic subjects. The results depicts that FBS level in group AL300, showed significantly decreased in fourth week after the intervention, compared to PL in the same time ($p = 0.001$). Also, HbA1C level in this group at the eighth week after the intervention ($p = 0.042$), had a significant decrease [14].

The study shows that the demographic variable gender had shown statistically significant association with post test level of blood glucose level among diabetes mellitus patients at $p < 0.05$ level and the other demographic variables had not shown statistically significant association with posttest level of blood glucose level among diabetes mellitus patients in the experimental group.

Present study finding indicates that the *Aloe vera* has got a

positive effect in reducing blood glucose level among diabetics which is very affordable and feasible measure for general public also it is noticed that as the duration of administration increases greater the effectiveness even though in present study the duration of administration of *Aloe vera* juice was limited to one weeks. No adverse effects and allergic reactions were noted during the administration of *Aloe vera*.

4. Conclusion

Use of Aloe vera extract in pre-diabetic patients can significantly regulate levels of fast blood glucose within four weeks. It could be an interesting supplement strategy to alleviate impaired serum glucose level. We had some limitations in quantitative control of some extraneous variables such as food intake which could be considered for future researches.

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