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Advances in Bioresearch

ORIGINAL ARTICLE

Effectiveness of Lady's Finger Juice on Blood Glucose Level Among Pre-Diabetic Clients at Selected Urban Diabetic Centre, Coimbatore

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ABSTRACT

Pre-diabetes, characterized by elevated blood glucose levels below the threshold for type 2 diabetes, is a growing public health concern, particularly in urban India. Non-pharmacological interventions, such as dietary modifications, are critical for its management. Lady's finger (okra) juice, rich in soluble fiber and antioxidants, has shown potential hypoglycemic effects. This study evaluates the effectiveness of lady's finger juice in controlling blood glucose levels among pre-diabetic clients. A true experimental pre-test post-test control group design was employed, involving 60 pre-diabetic clients (30 experimental, 30 control) at an Urban Diabetic Centre in Coimbatore, India. The experimental group consumed 150 ml of lady's finger juice daily for 30 days, prepared by soaking one medium-sized okra in water overnight. Fasting blood glucose levels were measured using a calibrated glucometer before and after the intervention. Data were analyzed using paired and unpaired t-tests for effectiveness and chi-square tests for associations with demographic variables. The experimental group showed a significant reduction in mean fasting blood glucose levels from 119.87 ± 16.53 mg/dl (pre-test) to 106.93 ± 10.84 mg/dl (post-test) ($p \leq 0.01$, $t=6.45$). The control group exhibited no significant change (116.63 ± 13.25 mg/dl to 116.83 ± 14.60 mg/dl). Post-test comparison between groups confirmed the effectiveness of lady's finger juice ($p \leq 0.01$, $t=2.92$). Significant associations were found between blood glucose levels and demographic variables (age, sex, occupation, income, exercise, family history, BMI) in the experimental group, except for education. Lady's finger juice is an effective, cost-effective, and accessible intervention for controlling blood glucose levels in pre-diabetic clients. Its integration into community health practices could aid in preventing progression to type 2 diabetes, particularly in resource-limited settings.

Keywords: *Pre-diabetes, Lady's finger juice, Blood glucose level, non-pharmacological intervention, Urban India.*

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INTRODUCTION

"The doctor of the future will no longer treat the human frame with drugs, but rather will cure and prevent disease with nutrition".
Thomas Edison

The unprecedented economic development and rapid urbanization in Asian countries, particularly in India, has led to a shift in health problems from communicable to non-communicable diseases [1]. The silent pandemic diabetes mellitus is a challenging problem for public health worldwide [2,3]. Primary prevention aims to stop the development of diabetes [2,3]. Pre-diabetes or borderline diabetes mellitus is an intermediate or transitional condition in which some of the essential features of diabetes mellitus are present. It is often described as an intermediate state between normal blood glucose levels and those seen in diabetes mellitus. If not managed appropriately, pre-diabetes can progress to type 2 diabetes mellitus.

Diet is one of the treatments common to all diabetics [4,5]. Okra is considered one of the important medicinal vegetables, although it is not universally preferred. Its immense health benefits include insulin-like properties that help reduce blood glucose levels in diabetes mellitus; support red blood cell production and thereby help prevent anaemia; and provide high antioxidant activity that protects the

immune system against harmful free radicals and prevents cellular mutations, thus exhibiting anti-cancer properties.

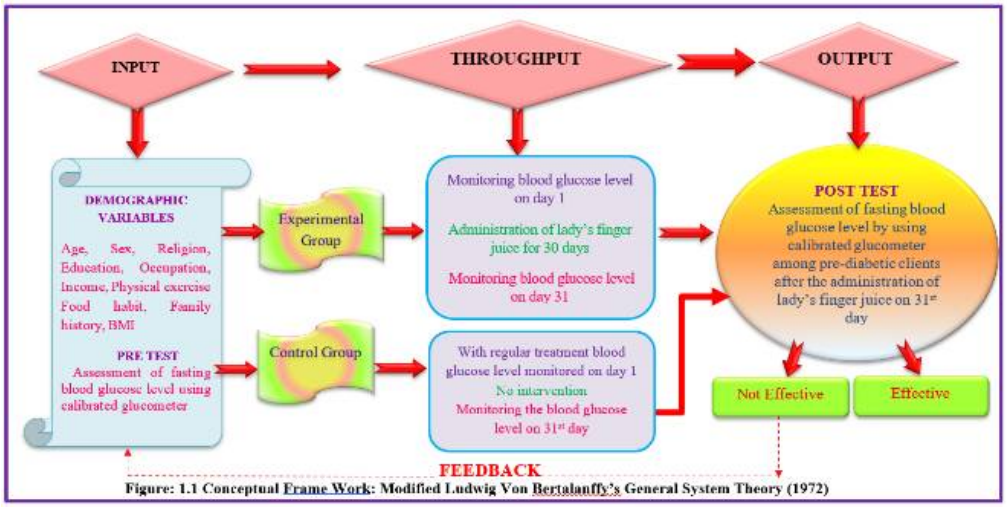

Figure: 1.1 Conceptual Frame Work: Modified Ludwig Von Bertalanffy's General System Theory (1972)

Conceptual Frame Work: Modified Ludwig Von Bertalanffy's General System Theory (1972)

MATERIAL AND METHODS

Research methodology is the overall plan for addressing the research problem. It covers multiple aspects of the study's structure. It acts as a guide for planning, implementation and analysis of the study. It includes the descriptions of the research approaches, research design, dependent and independent variables, sampling design, sampling criteria, description of the tool, pilot study, and a planned format for data collection and a plan for data analysis [26].

According to Polit and Hungler, Methodology refers to ways of obtaining, organizing and analysing data. Methodology decisions depend on the nature of the research question [27].

According to Judith Haber, Research methodology is the development and evaluation of data collection instrument, scale or technique. The role of methodology consists of procedure and technique for conducting a study [28].

Research Approach

According to Polit and Beck described research approaches are plans and the procedures for research that span the steps from broad assumptions to detailed methods of data collection, analysis, and interpretation. The present study has selected quantitative evaluative approach [29].

Research Design

According to Polit and Beck designed is the overall plan for addressing a research question, including strategies for enhancing the study's integrity [30].

The design selected for the present study was a true experimental design with pre-test post-test control group design.

RE	O1	X	O2
RC	O1	-	O2

Key:

RE- Randomized experimental group
RC- Randomized control group
O1- Pre-test for both experimental group and control group
X- Intervention to experimental group (Lady's finger juice)
-- No intervention
O2- Post test for both experimental group and control group

Research Variables

According to Suresh K Sharma (2013), Research variables are the qualities, properties, or characteristics which are observed or measured in a natural setting without manipulating and establishing cause- and-effect relationship [31].

Independent variable: Lady's finger juice
Dependent variable: Blood glucose level of pre-diabetic clients
Attribute variable: Age, gender, religion, education, occupation, income, physical exercise, food habit, presence family history and BMI.

Settings

According to Nancy Burns and Susan K Groove (2007), the study setting is the physical location in which study was conducted.

The study was conducted in the Urban Diabetic Centre of Kongunad Hospitals Pvt Ltd, Coimbatore. Kongunad Hospital is a 250 bedded Multi Speciality hospital with all infrastructure resources. Everyday 10-15 pre-diabetic clients attend the diabetic centre and in average about 300-400 clients attend the diabetic centre per month.

Population

According to Polit and Beck (2010), population is the entire set of individuals or objects having some common characteristics; sometimes called universe [29].

Target Population

According to Polit and Beck (2010), target population is the entire population in which a researcher is interested and to which he or she would like to generalize the study results.

The Target population of the present study were pre-diabetic clients.

Accessible Population

According to Polit and Beck (2010), accessible population is the population of people available for a particular study- often, a non-random subset of the target population [29].

The Accessible population of the study were pre-diabetic clients who visited the selected Urban Diabetic Centre of Kongunad Hospitals Pvt Ltd, Coimbatore.

Sampling

According to Polit and Hungler (1999), Samples is the subset of population selected to participate in a research study. The sampling technique is the process of selecting a portion of the population to represent the entire population [29].

The samples selected were from a selected Urban Diabetic Centre of Kongunad Hospitals Pvt Ltd, Coimbatore based on the inclusion criteria. The samples were randomly divided into experimental and control group.

Sample Size

According to Suresh K Sharma (2013), sample size is the number of subjects, events, behaviours, or situations that are examined in a study [31].

The sample size for this study was 60 pre-diabetic clients (30 in experimental group; 30 in control group).

Sampling Technique

A sampling technique is the name or other identification of the specific process by which the entities of the sample have been selected.

Simple random sampling technique using lottery method was used for the present study.

Sampling Criteria

According to Suresh K Sharma (2013), sampling criteria is the list of the characteristics essential for inclusion or exclusion in the target population [31].

Inclusion criteria

- Clients who are diagnosed to have pre-diabetes.
- Clients of both genders.
- Clients who are willing to participate in the study.

Exclusion criteria

- Clients who have any other morbidities like cardiovascular disorders, immune disorders, hypothyroidism, kidney diseases and other chronic diseases.
- Clients who are on medications for pre-diabetes.

Description of the Tool

According to Carol L Macnee (2004), the study methods used to collect data are intended to allow the researcher to construct a description and meaning of the variable under study.

The tool was developed after extensive review of literature, internet sources and discussion with experts. The instrument used in this study consists of the following sections:

Section A

Baseline Proforma: This section consists of questions which seek information regarding demographic data such as age, sex, religion, education, occupation, income, physical exercise, family history, food habits and BMI.

Section B

Glucometer: A calibrated glucometer to measure the blood glucose level.

Section C

Observation checklist for monitoring the intake of lady's finger juice for experimental group.

Content Validity

According to Polit and Beck (2010), validity is a quality criterion referring to the degree to which interferences made in a study are accurate and well-founded; in measurement, the degree to which an instrument measures what it is intended to measure [29].

The tools used for this study was validated by six experts in the field of Community Health Nursing and preventive medicine and an expert from the field of diabetology. Suggestions were considered and appropriate changes were made and the tool was found to be valid.

Reliability

According to Polit and Beck (2010), reliability is the degree of consistency or dependability with which an instrument measures an attribute [29].

The reliability of the glucometer and the test strip was tested using the accu-check solution. Reliability of the tool was assessed by using test retest method. Karl Pearson's formula was used to calculate the Correlation coefficient. The r value obtained was 0.96 which indicates the high reliability of the instrument. This correlation coefficient was very high and it was a good tool for assessing the effectiveness of lady's finger juice on blood glucose level among pre diabetic clients.

Ethical Consideration

Ethical consideration is pertaining to or dealing with morals or the principles of morality; pertaining to right and wrong in conduct. Being in accordance with the rules or standards for right conduct or practice, especially the standards of a profession.

A formal permission was obtained from Dr P Raju, MS, Managing Director of Kongunad Hospitals Pvt Ltd. Information was given to all the samples about the purpose of study. Informed written consent was obtained from the samples. The samples had the complete freedom to withdraw from the study at their own reason.

Pilot Study

According to Polit and Beck (2010), is a small- scale version, or trial run, done in preparation for a major study [29].

The pilot study was conducted to test the feasibility of setting, samples, relevance and practicability of the intervention. Pilot study was conducted in a Diabetic Clinic from 09.07.2014 to 24.07.2014. A brief self-introduction was given to the samples. Using simple random sampling technique, 12 samples who met the inclusion criteria were selected. Out of 12 samples, 6 were in the experimental and remaining 6 samples in the control group. The purpose of the study was explained to the clients and after getting informed written consent, the baseline data was collected. Fasting blood glucose was checked for both the groups on day 1. From the next day, the lady's finger juice was given to the experimental group every morning in empty stomach. The acceptance level was high among the samples and they were very interested and cooperative in consuming the juice. The pilot study showed that the study was researchable and feasible.

Data Collection Procedure

According to Suresh K Sharma (2013), data collection is the identification of subjects and the precise, systematic gathering of information (data) relevant to the research purpose or the specific objectives, questions, or hypothesis of a study [31].

- Prior to the data collection, written permission was obtained from the concerned authorities for conducting the study including ethical committee clearance.
- The investigator conducted pre-diabetic screening camp from 01.07.2014 to 07.07. 2014 at the selected urban health centre, Coimbatore.
- Around 120 clients were screened among which 90 of them were diagnosed to have pre-diabetes by a diabetologist.
- From 90 samples 60 were selected using simple random sampling technique by lottery method.
- Among the 60 samples 30 samples were randomly assigned to experimental and control group respectively.
- Informed Written consent was obtained from the samples and confidentiality was assured.
- The investigator collected the baseline data and checked the pre-test blood glucose level of clients using the glucometer on Day 1(31.07.2014) from both experimental and control group.
- The investigator administered the lady's finger juice to the experimental group and recorded the daily intake of lady's finger juice.
- Experimental group consumed the lady's finger juice from Day-2 for 30 consecutive days and on the 31st Day the post-test blood glucose level was checked for both the groups.

Plan for Data Analysis

According to Polit and Beck (2010), data analysis is the systematic organization and synthesis of research data and, in quantitative studies, the testing of hypotheses using those data.

Data were analysed using both descriptive and inferential statistics. Base line variables were analysed by frequency and percentage distribution. Mean, Standard deviation were used to analyse the blood glucose level among pre-diabetic clients both in experimental and in the control group. To evaluate the effectiveness of lady's finger juice on pre and post-test blood glucose level of experimental group paired 't' test was used and unpaired 't' test was used to evaluate the effectiveness of lady's finger juice on post-test blood glucose level among experimental and control group. Chi-square test was used to find the association between the pre and post-test blood glucose level in experimental group and selected demographic variables. The significant findings of the study were expressed in the form of tables and diagrams.

SCHEMATIC REPRESENTATION OF RESEARCH STUDY

Fig.3.1. SCHEMATIC REPRESENTATION OF RESEARCH STUDY

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RESULTS

According to Polit and Hungler (2006), analysis is a method of rendering data in quantitative, meaningful and intelligible manner, so that research problem can be studied and tested and the relationship between the variables can be found [29].

This chapter deals with analysis and interpretation of data collected from 60 pre-diabetes clients at selected urban health centre, Coimbatore in order to assess the effectiveness of lady's finger juice on blood glucose level.

The data collected were analysed using descriptive and inferential statistics which are necessary to provide substantive summary by the results in relation to the objectives.

Presentation of Data

The findings of the study were grouped, analysed, organized and presented under the following sections:

Section A:

Distribution of pre diabetic clients according to their demographic variables in experimental and control group.

Section B:

Comparison of pre-test and post-test level of blood glucose among experimental and control group.

Section C:

Testing hypotheses

a.Effectiveness of lady's finger juice on blood glucose level among experimental group

b.Effectiveness of lady's finger juice on blood glucose level among experimental and control group
c.Association between the blood glucose level and their selected demographic variables in experimental and control group

SECTION A

Distribution of pre diabetic clients according to their demographic variables in experimental and control group

Table 4.1: Distribution of pre diabetic clients according to their demographic variables for experimental and control group

n=60

S.No	Demographic Variable	Experimental Group n =30		Control Group n =30	
		Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
1.	Age in year				
	a) 21-30 Years	3	10.00	7	23.33
	b) 31-40 Years	9	30.00	12	40.00
	c) 41-50 Years	8	26.67	6	20.00
	d) 51-60 Years	6	20.00	5	16.67
	e) 61-70 Years	3	10.00	0	0
	f) 71-80 Years	0	0	0	0
	g) 81-90 Years	1	3.33	0	0
2.	Sex				
	a) Male	10	33.33	10	33.33
	b) Female	20	66.67	20	66.67
3.	Religion				
	a) Hindu	27	90.00	25	83.33
	b) Christian	1	3.33	4	13.34
	c) Muslim	2	6.67	1	3.33
4.	Education				
	a) Illiterate	10	33.33	1	3.33
	b) Primary education	4	13.34	3	10.00
	c) Secondary education	3	10.00	15	50.00
	d) Higher secondary	6	20.00	5	16.67
	e) Graduation	7	23.33	6	20.00
5.	Occupation				
	a) Heavy worker	9	30.00	11	36.67
	b) Moderate worker	10	33.33	14	46.66
	c) Sedentary worker	11	36.67	5	16.67
6.	Income per month				
	a) Rs <5000	2	6.67	4	13.33
	b) Rs5001-Rs7500	8	26.67	4	13.33
	c) Rs7501-Rs10000	7	23.33	6	20.00
	d) Rs>10000	13	43.33	16	53.34
7.	Physical exercise				
	a) Walking	4	13.33	6	20.00
	b) Yoga	2	6.67	0	0.00
	c) Physiotherapy	1	3.33	0	0.00
	d) None	23	76.67	24	80.00
8.	Food habits				
	a) Vegetarian	4	13.33	2	6.67
	b) Non-vegetarian	26	86.67	28	93.33
9.	Presence Family history				
	a) Present	12	40.00	13	43.33
	b) Absent	18	60.00	17	56.67
10.	BMI				
	a) Under weight	1	3.33	0	0
	b) Normal	14	46.67	9	30
	c) Over weight	14	46.67	20	66.67
	d) Obese	1	3.33	1	3.33

Age: The above table 4.1 shows that in experimental group, 9 (30%) samples belong to the age group of 31-40 years, 8 (26.67%) come under the age group of 41-50 years, 6 (20%) were between 51-60 years, 3 (10%) were between 21-30 years and 61-70 years respectively. 1 (3.33%) belong to age group of 81-90 years and none of them were between 71-80 years.

In control group, 12 (40%) samples were in the age group of 31-40 years, 7 (23.33%) come under the age group of 21-30 years, 6 (20%) were between 41-30 years, 5 (16.67%) were between 51-60 years and none of them were between 61-90 years.

Sex: In experimental group, 20 (66.67%) samples were female and 10 (33.33%) were male.

In control group, 20 (66.67%) samples were female and 10 (33.33%) were male.

Religion: In experimental group, most of the samples 27 (90%) were Hindus. There were 2 (6.67%) Muslims and 1 (3.33 %) Christian.

In control group, 25 (83.33%) samples were Hindus, 4 (13.34%) were Christians and 1 (3.33 %) was Muslim.

Education: In experimental group, 10 (33.33%) samples were illiterate, 7 (23.33%) were graduates, 6 (20%) had higher secondary education, 4 (13.34%) had primary education and 3 (10%) had secondary education.

In control group, half of samples 15 (50%) completed secondary education, 6 (20%) were graduates, 5 (16.67%) had higher secondary education, 3 (10%) had primary education and 1 (3.33%) was an illiterate.

Occupation: In experimental group, 11 (36.67%) samples were sedentary workers, 10 (33.33%) were moderate workers and 9 (30%) were heavy workers.

In control group, 14 (46.66%) samples were moderate workers, 11 (36.67%) were heavy workers and 5 (16.67%) were sedentary workers.

Income: In experimental group, 13 (43.33%) of the samples were earning monthly income Rs.10000 and above, 8 (26.67%) of the samples were earning between Rs.5001- Rs. 7500, 7 (23.33%) of the samples were earning between

Rs. 7501-Rs 10000 and 2 (6.67%) of the samples were earning monthly income less than Rs. 5000.

In control group, more than half of the samples 16 (53.34%) were earning monthly income of Rs.10000 and above, 6 (20%) of the samples were earning between Rs. 75001- Rs. 10000, 4 (13.33%) were earning monthly income less than
Rs. 5000 and Rs.5001-7500 respectively.

Physical Exercise: In experimental group, majority of the samples 23 (76.67%) did not practice any exercises, 4 (13.33%) practiced walking, 2 (6.67%) practiced yoga and 1 (3.33%) was under regular physiotherapy.

In control group, most of the samples 24 (80%) did not practice any exercises, 6 (20%) practiced walking, none of them practiced yoga and physiotherapy.

Food Habit: In experimental group, most of them 26 (86.67%) were Non-vegetarian and 4 (13.33%) were vegetarian.

In control group, almost all the samples 28(93.33%) were Non-vegetarian and 2(6.67%) were vegetarian.

Presence Family History: In experimental group, more than half of the samples 18 (60%) had no family history of diabetes and 12 (40%) had family history of diabetes.

In control group, more than half of the samples 17 (56.67%) had no family history of diabetes and 13 (43.33%) had family history of diabetes.

Body Mass Index: In experimental group, 14 (46.67%) were normal and overweight respectively, 1 (3.33%) was underweight and 1 (3.33%) was obese.

In control group, 20 (66.67%) were overweight, and 9 (30%) were normal and 1 (3.33%) was obese and none of them were underweight.

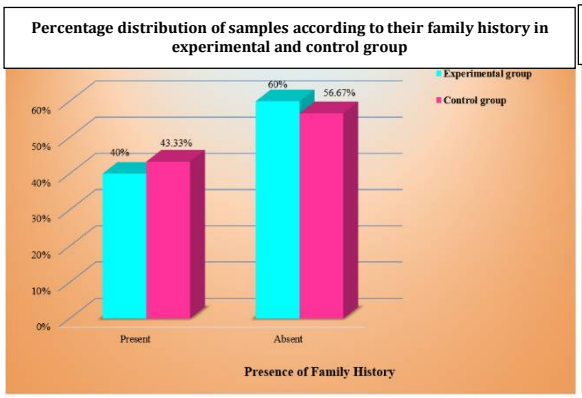


Fig.4.9. Percentage distribution of samples according to their family history in experimental and control group

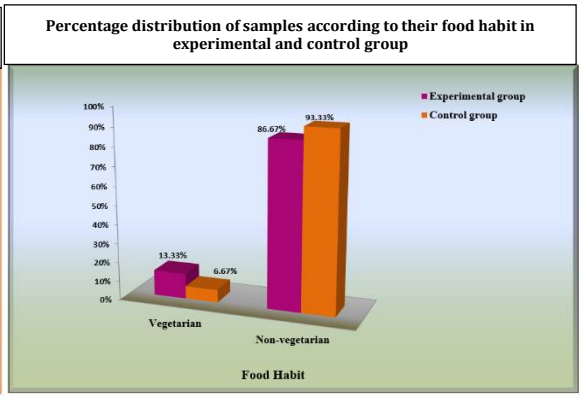


Fig.4.8. Percentage distribution of samples according to their food habit in experimental and control group

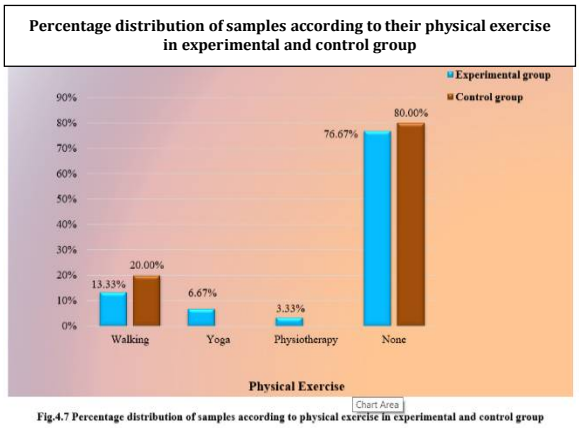


Fig.4.7 Percentage distribution of samples according to physical exercise in experimental and control group

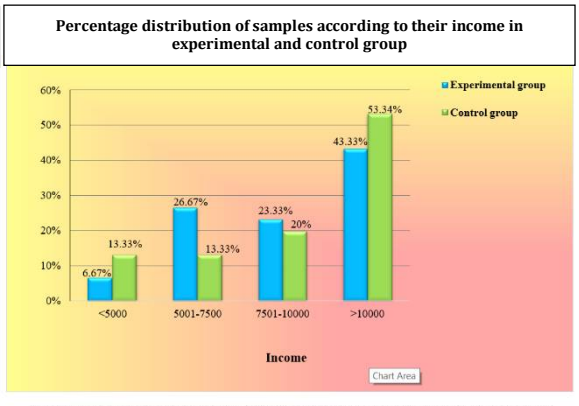
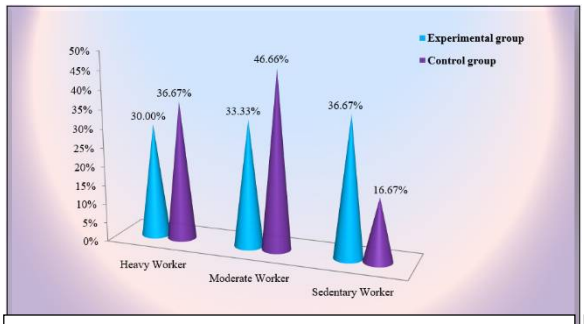
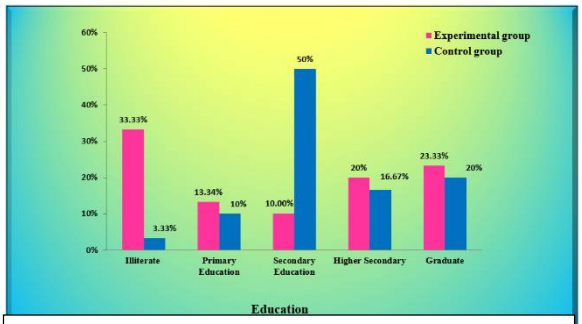


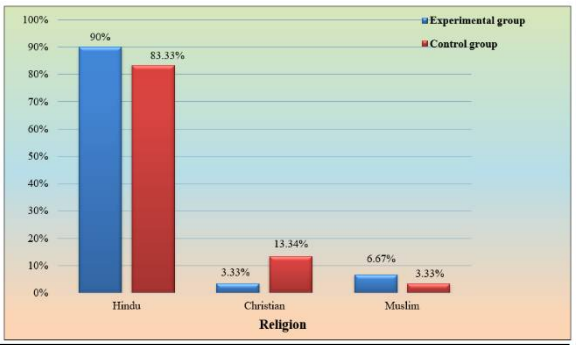
Fig.4.6 Percentage distribution of samples according to their income in experimental group and control group



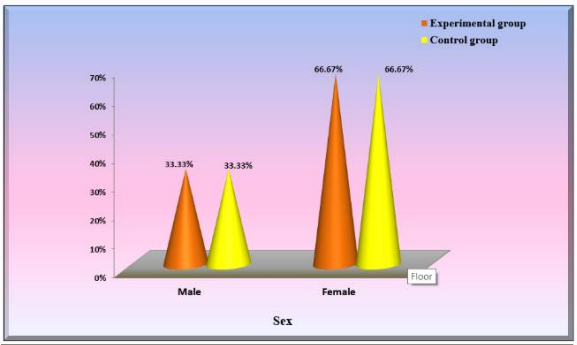
Percentage distribution of samples according to their occupation in experimental and control group



Percentage distribution of samples according to their education in experimental and control group



Percentage distribution of samples according to their religion in experimental and control group



Percentage distribution of samples according to their sex in experimental and control group

Percentage distribution of samples according to their age in experimental and control group

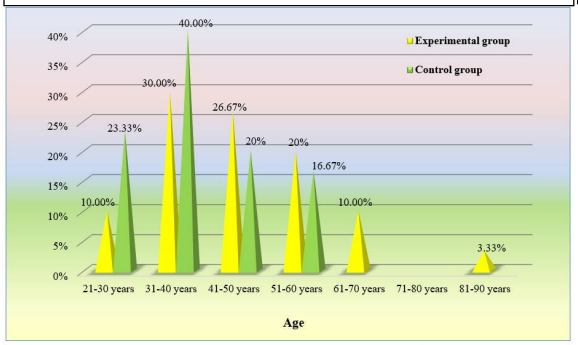


Fig.4.1 Percentage distribution of samples according to their age in [Chart Area] and control group

Percentage distribution of samples according to their body mass index in experimental and control group

Fig.10. Percentage distribution of samples according to their body mass index in experimental and control group

SECTION B

Comparison of mean and standard deviation of blood glucose level among pre-diabetic clients during pre and post-test in experimental and control group.

Table 4.2 Comparison of mean and standard deviation of blood glucose level among pre diabetic clients during pre and post-test in experimental and control group

n=60

	Pre test		Post test		Mean difference
	Mean	SD	Mean	SD	
Experimental group n=30	119.87	16.53	106.93	10.84	12.94
Control group n=30	116.63	13.25	116.83	14.60	0.2

The above table 4.2 shows the comparison of overall mean and standard deviation of experimental and control group before and after the intervention.
In Pre-test the mean and the standard deviation was 119.87±16.53 in the experimental group and 116.63± 13.25 in the control group respectively.
In Post-test the overall mean and standard deviation was 106.93 ±10.84 in the experimental group and 116.83±14.60 in the control group respectively.
The mean difference of experimental group is 12.94 and the control group is 0.2.

SECTION C

Testing hypothesis

a) Effectiveness of lady's finger juice on blood glucose level among experimental group

Table 4.3 Paired 't' test value of pre and post-test blood glucose level of experimental group

n=30

Experimental group	Mean	SD	Paired 't' Value	df
Pre-test	119.87	16.53	**6.45	29
Post-test	106.93	10.84		

Table value = 2.46 ****Highly Significant at p≤0.01**

Table.4.3 Paired 't' test value of pre and post-test blood glucose level of experimental group.

The above table 4.3 portraits the paired 't' test value which was calculated to analyse the effectiveness of lady's finger juice on blood glucose level among experimental group. The calculated t value 6.45 was greater than the table value 2.46 which is highly significant at p≤0.01. It shows that the lady's finger juice was effective in controlling the blood glucose level among the pre-diabetic clients. Hence, the hypothesis H1 is retained.

b) Effectiveness of lady's finger juice on blood glucose level among experimental and control group.

Table 4.4 Unpaired 't' test value of post-test blood glucose level of experimental and control group

n=60

Group	Mean	SD	Unpaired 't' value	df
Experimental group n=30	106.93	10.84	**2.92	58
Control group n=30	116.83	14.60		

Table value =2.39 ****Highly Significant p≤0.01**

Table 4.4 Paired 't' test of pre and post-test blood glucose level of experimental group

The above table 4.4 depicts the unpaired 't' test which was calculated to analyse the effectiveness of lady's finger juice on blood glucose level among experimental group. The calculated t value 2.92 was greater than the table value 2.39 which is highly significant at p≤0.01. It shows that the lady's finger juice was effective in controlling the blood glucose level among the pre-diabetic clients. Hence, the hypothesis H2 is retained.

c)Association between the blood glucose level among pre-diabetic clients and their selected demographic variables in both experimental and control group.

Table 4.5 Association between the pre-test and post-test blood glucose level among pre-diabetic clients and their selected demographic variables in the experimental group and control group

n=60

S.no	Demographic Variables	Experimental group n=30		Control group n=30	
		Pre-test	Post-test	Pre-test	Post-test
1	Age	2.79	***2.26**	3.9	***2.8**
2	Sex	1.7	***0.16**	0.28	***0.28**
3	Religion	1.04	***1.04**	1.09	1.9
4	Education	5.5	9.54	2.89	4.88
5	Occupation	2.85	***0.06**	2.85	***1.67**
6	Income	2.42	***0.72**	3.64	***2.92**
7	Exercise	2.16	***1.6**	2.71	***1.2**
8	Family history	0.47	***0.16**	0.44	2.4
9	BMI	4.44	***3.35**	1.74	2.76

*Significant

Table 4.5 Association between the pre-test and post-test blood glucose level among pre-diabetic clients and their selected demographic variables in the experimental group and control group

The above table 4.5 displays that in the experimental group there was a significant association found between age, sex, religion, occupation, income, exercise, family history and BMI whereas, education was not associated. Hence, in experimental group the hypothesis H3 is accepted for all the variables and rejected for only education. In control group, age, sex, occupation, income and exercise were found significant whereas religion, education, family history and BMI were not associated. Hence, the hypothesis H3 is accepted for age, sex, occupation, income, exercise and rejected for religion, education, family history and BMI.

DISCUSSION

This study evaluated the effectiveness of lady's finger juice on blood glucose levels among pre-diabetic clients at a selected urban health centre in Coimbatore. A true experimental pre-test post-test control group design was adopted. Data was collected using a structured interview schedule, and blood glucose levels were measured with a calibrated glucometer. To maintain homogeneity, all selected samples were free from any diabetes medications.

Baseline Characteristics

Experimental Group: The majority of participants (30%) were aged 31–40 years, followed by 26.67% in the 41–50 age group. Smaller proportions fell in the 51–60 (20%), 21–30 (10%), and 61–70 (10%) age groups, with just one participant aged 81–90 and none between 71–80 years.

Control Group: Most participants (40%) were aged 31–40 years, followed by 23.33% in the 21–30 group, 20% in the 41–50 group, and 16.67% in the 51–60 group. No participants were aged above 60.

In both groups, 66.67% were female and 33.33% were male. The majority in the experimental group were Hindu (90%), with small representations of Muslims (6.67%) and Christians (3.33%). The control group had 83.33% Hindus, 13.34% Christians, and 3.33% Muslims.

Educationally, the experimental group had a higher proportion of illiterates (33.33%), while half of the control group had completed secondary education (50%). Occupationally, the experimental group leaned toward sedentary work (36.67%), while the control group was predominantly moderate workers (46.66%). Income levels were broadly similar, with the majority in both groups earning Rs. 10,000 or more per month.

Regarding lifestyle, most participants in both groups did not practice any physical exercise — 76.67% in the experimental group and 80% in the control group. Non-vegetarian diets were common in both groups (86.67% experimental; 93.33% control). Family history of diabetes was present in 40% of experimental and 43.33% of control participants. BMI distribution showed 46.67% of the experimental group were normal weight, while 66.67% of the control group were overweight.

These findings align with a 2011 cross-sectional study by Pradana Soewondo and Laurentius A. Pramono on pre-diabetes prevalence in Indonesia (n=24,417), which similarly showed higher female representation (61.6%) and low physical activity rates (72.7% not exercising).

Findings Based on Objectives

Objective 1: Assessing Blood Glucose Levels

Pre-test mean fasting blood glucose levels were comparable between groups — 119.87 ± 16.53 in the experimental group and 116.63 ± 13.25 in the control group, confirming baseline homogeneity.

Post-test results showed a notable reduction in the experimental group (106.93 ± 10.84), while the control group remained virtually unchanged (116.83 ± 14.60). The mean difference was 12.94 in the experimental group versus just 0.2 in the control group, clearly indicating the impact of the intervention.

A 2014 study by Rebecca J. Tanner et al. on pre-diabetes prevalence in England (2003–2011) provides relevant context, reporting a rise in pre-diabetes prevalence from 11.6% to 35.3% over eight years, with overweight individuals aged 40 and above being particularly vulnerable. This underlines the growing need for effective, accessible interventions.

Objective 2: Evaluating Effectiveness of Lady's Finger Juice

A paired t-test was used to assess within-group changes in the experimental group. The pre-test mean (119.87 ± 16.53) versus the post-test mean (106.93 ± 10.84) yielded a t-value of 6.45 at $p \leq 0.01$, which was highly significant compared to the table value of 2.46. This confirmed a meaningful reduction in fasting blood glucose levels following regular consumption of lady's finger juice, retaining hypothesis H1.

An unpaired t-test comparing post-test values between the two groups gave a calculated value of 2.92, exceeding the table value of 2.39 at $p \leq 0.01$, further confirming the effectiveness of the intervention and retaining hypothesis H2.

These results are supported by a 2014 study by Sarika Davis conducted in Mangalore, which assessed lady's finger juice among type 2 diabetic clients aged 45–60. Pre-test fasting blood glucose was 219.3 ± 69.3, declining to 199 ± 67.9 by day 7 and 189.45 ± 67.2 by day 11, demonstrating a progressive reduction attributable to the juice.

Objective 3: Association with Demographic Variables

In the experimental group, blood glucose levels showed significant associations with age, sex, religion, occupation, income, exercise, family history, and BMI. Education was the only variable with no significant association, leading to partial acceptance of hypothesis H3.

In the control group, significant associations were found with age, sex, occupation, income, and exercise, while religion, education, family history, and BMI were not significantly associated.

CONCLUSION

The study conclusively demonstrated that lady's finger juice is effective in reducing blood glucose levels among pre-diabetic clients. Statistical analysis confirmed significant differences between pre- and post-test readings within the experimental group, as well as between the post-test values of the experimental and control groups. Given that lady's finger is inexpensive and widely available, particularly in community settings, it represents a practical, non-pharmacological option for managing pre-diabetes.

IMPLICATIONS AND RECOMMENDATIONS

The findings carry implications across nursing practice, education, research, and administration. Community health nurses should prioritize awareness programs on non-pharmacological interventions like lady's finger juice in NCD management. Nurse educators should incorporate such evidence-based remedies into nursing curricula, while administrators should organize staff development programs promoting knowledge in this area.

For future research, the study recommends larger sample sizes for generalizability, comparative studies (e.g., lady's finger vs. curry leaves), studies across different clinical settings, similar research on type 2 diabetes, and gender-comparative analyses. Broader and more rigorous investigation in the area of pre-diabetes management is strongly encouraged.

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