

**THE EFFECTS OF DIETITIAN-LED NUTRITION EDUCATION AND COUNSELING ON NUTRITIONAL KNOWLEDGE
OF TYPE 2 DIABETES IN NIGERIA**

Author: Collins, P. I.

Department of Dietetics, University of Port Harcourt Teaching Hospital, Rivers State.

Corresponding author: peacecollins60@gmail.com

Author's contributions

This study was a collaborative effort of the author. The author reviewed and approved the final version of the manuscript for publication.

Article Information

DOI: <https://doi.org/10.60787/fpj.vol2no10.177-195>

EISSN 1596-0501E

Website: <https://frontlineprofessionalsjournal.info>

Email: frontlineprofessionalsjournal@gmail.com

CITATION: Collins, P. I. (2025). The effects of dietitian-led nutrition education and counseling on nutritional knowledge of type 2 diabetes in Nigeria. *Frontline Professionals Journal 2(10), 177-195*

ABSTRACT

Type 2 diabetes is not evenly spread across various geographical areas in Nigeria with the south-south region recording the highest prevalence. The diet has been shown to be properly managed to prevent complications and enhance the outcomes. The study assess the effects of dietitian-led nutrition education and counseling on nutritional knowledge of diabetes in pre and post intervention among adult type 2 diabetes in Nigeria. It is a quasi-experimental study that is located in a hospital. A total of seventy-nine subjects from each group were randomly selected to be included in the intervention and control group in a ratio of 1:1. The baseline data was thus gathered at the beginning of the study. The intervention group members were given 3 months of nutrition education lessons every week. The last aspect of the study was data collection. In the control group, the mean knowledge score was 47.08 ± 12.94 at baseline and 47.19 ± 12.85 at end end-line level. Fifty-seven percent had poor knowledge at baseline and at end line in the control group. The baseline level of knowledge was 50.71 ± 15.5 in the intervention group, 48% of the respondents were poor with respect to their knowledge at the baseline level and 71% were good with respect to their knowledge at the end line level. The end line knowledge score was 74.6 ± 11.24 . The intervention had a significant and moderate positive effect on food choice and knowledge ($r=0.471$, $p=0.000$). The paper has demonstrated that dietary intervention by a dietitian can significantly change the compliance to healthy eating behavior by patients by effective increase the level of fiber intake and decrease calorie intake which was effective in glycemic targets. The government should employ dietitians in all the health care centers so that they can provide integrate programs that will incorporate nutrition education in the existing health system service. This intervention will probably lead to significant glycemic control of patients with T2DM provided it is done regularly in every hospital in Nigeria.

Key word: dietary management, Medical nutrition therapy, knowledge of foods, portion control.

1.0 INTRODUCTION

It is approximated that 629 million diabetics will occur in the year 2045 compared with 425 million in the same year 2017, and, thus, it will be a major health challenge in the world as well as a challenge with its social, economic and

health effects (IDF, 2017). IDF Diabetes Atlas (2021) estimates the prevalence of diabetes among adults aged 20-79 in the year 2021 and 2045 at the annual global, regional, and national prevalence rates as 10.5 per cent (536.6 million) and 12.2 per cent (783.2 million), respectively. Prevalence rates were the most common in both men and women as well as in individuals who were above ages of 75-79 years. The sugar is not absorbed by the cells but goes in the bloodline where there is diabetes mellitus type 2. The pancreatic beta cells become more active to produce more insulin as a result of the increase in the levels of blood sugar. Later, the degeneration of the cells occurs, having no ability to produce insulin in the body (Mayo Clinic, 2022). The management of the medical nutrition therapy, rather than those of their doctors or dietitians, dictates the daily food choice of patients with diabetes whose success relies on the management of the medical nutrition therapy. In this way, it has been found that the patient-centered modalities engaged in encouraging self-management may aid during nutritional education of a patient (ADA, 2021). The Guidelines of Diabetes Treatment, (2021) combine medical nutrition therapy practice, as a model aimed at providing persons with evidence-based education of trained dietitians who, in turn, coach, teach coping skills and unambiguous information on evidence-based medicine.

A dietitian is an individual who has a nationally acclaimed degree in nutrition and dietetics (s). The role of Registered Dietitians is the certified health practitioners worldwide, who are able to evaluate and specify as well as cure food and nutritional conditions on an individual and a population level of health (ICDA, 2016).

Dietitians are entrusted with a mandate of diagnosing treatment and evaluation of food and nutritional related challenges on a professional and ethical basis. The code of conduct gives a measure of accountability to dietitians who are representing the optimum interest of the population. Professional guidelines code also exists and it is the subject of the whole dietetic workforce. All these norms will be applicable and lead in decision making in moral and professional dilemma. They are the supports of the science of dietetics in the world. Dietitians perform numerous tests, counselling and education on diverse range of conditions that are related to diet such as obesity disorder, geriatric nutrition, diabetes mellitus, hypertension, liver related diseases, kidney ailments, malnutrition, and gout disorders among others. It is also implicitly found in an excellent diet, that therapeutic nutritionists analyze and gauge patient advancements in their wellbeing as a general sense (ICDA, 2016).

Through nutrition knowledge and capability, type 2 diabetes may be controlled in regard to optimal metabolism self-care and quality of life due to food selection that individuals with the condition make (British Journal of Nutrition, 2015). After they have been diagnosed, diabetes is irreversible but through wellness programs that consist of both dietary, physical and medication program, quality of life would be enhanced and the disease dealt with in proper ways. Still, simultaneously, a large percentage of diabetic patients with poor glycemic control remain, and the true cause of this circumstance is the lack of adherence to medical nutrition therapy (Ayasa *et al.*, 2022).

It has been proposed that medical nutrition therapy should be prescribed as a guideline in the process of managing type 2 diabetes. It proves that patient's education and adherence to self-management strategies would result in a significant improvement in patient health outcomes (Moller *et al.*, 2017). Thus the study assess the effects of dietitian-led nutrition education and counseling on nutritional knowledge of diabetes in pre and post intervention among adult type 2 diabetes in Nigeria.

2.0 MATERIALS AND METHOD

Research Design

The existing study qualifies as a quasi-experimental, hospital based study design, to establish the effects of dietitian-led nutrition education and counseling on nutritional knowledge of diabetes in pre and post intervention among adult type 2 diabetes in Nigeria.

Study Area

The study was conducted from September, 2023 to August, 2024 in two major tertiary hospitals which are University of Port Harcourt Teaching Hospital (UPTH) and Rivers State University Teaching Hospital (RSUTH) both in Rivers State, Nigeria.

Population of the study: The study population consist of adult type 2 diabetes aged 18 to 70 year old attending diabetic out-patients clinic in the two tertiary Hospitals of Port Harcourt with the cases of diabetes mellitus.

Eligibility Criteria

Inclusion Criteria

1. Cases of Type 2 diabetes with HbA1c level exceeding normal threshold within a period of 6 months.
2. Male or female 18 years and above who were diagnosed with diabetes and visited the diabetic out-patient clinic of the targeted hospital.
3. Those who gave consent to participate in the study and reside in Port Harcourt over one year.

Exclusion Criteria

The very ill patients such as those undergoing dialysis, having systematic blindness or both comorbidity or system pathology e.g. cancer, HIV/AIDS, cardiovascular disease as a result of the identification of a myocardial infarction or stroke etc.

Sampling Techniques

This research adopted the two stages sampling technique.

Stage 1: Simple random sampling method.

The choice of intervention and control sites was done using simple random sampling method through balloting which involves the coin-tossing method. UPTH was assigned to the role of an intervention hospital and RSUTH became the control one.

Stage 2: Systematic Random Sampling method.

The second phase was the patient selection. This was done on each of the clinic days. The sampling frame of the day was presented by the daily clinic attendance registered thus giving a list of patients confirmed to have diabetes in the clinic.

Sample Size

Sample size for this intervention study was determined using the sample size formula for comparison between two group means as follows: (Charan & Biswas, 2013)

$$\text{Sample size (n)} = \frac{2SD^2 (Z_{\alpha/2} + Z_{\beta})^2}{d^2}$$

Where:

n = Sample size

SD = Standard deviation = from previous studies or pilot study = 0.48 (1.36) (Sunuwar *et al.*, 2023)

$Z_{\alpha/2} = Z_{0.05/2} = Z_{0.025} = 1.96$ (From Z table) at type 1 error of 5%

$Z_{\beta} = Z_{0.20} = 0.842$ (From Z table) at 80% power

d = effect size = difference between mean values of HbA1c = (0.61) from previous intervention study (Sunuwar *et al.*, 2023).

$$\begin{aligned} \text{Sample size (n)} &= \frac{2(1.36)^2 (1.96 + 0.84)^2}{(0.61)^2} \\ &= \frac{3.6992 \times 7.84}{0.3721} = 77.9 \end{aligned}$$

Since the study attrition rate was likely to occur in each group, an allowance of 10% of the calculated sample size was made to accommodate 'drop-out' 10 % of 77.9 = 7.79

Sample size = 77.9 + 7.79 = 85.69 = 86

86 type 2 DM patients were approached and 79 of them participated till the end

Hence, at least 86 were approached and invited from each group and 79 patients participated.

The minimum size participated from each group = 79

Sampling instrument / tools

Instruments for data collection are:

Semi-Structured Questionnaire: The questionnaire consist of three sections. A: Socio-Demographic data, B: Biochemical and C: Diabetes / nutrition knowledge.

Diabetes knowledge Questionnaire

The DKQ is a 24-items questionnaire designed by Starr County Diabetes Education Study, 24 was used to assess the knowledge score on diabetes. There were three possible responses to the DKQ: "Yes," "No," and "Don't know." The correct response for each question received one point, whereas the incorrect response received no points. Each point received was summed for scoring. A higher score represents better diabetic knowledge (Garcia *et al.*, 2001),

Focus Group Discussion

Focus group discussion (FGD's) questionnaires were also used to collect data, but participants of a focus group discussion were also purposely sampled among the client database. There were developed four groups of Focus Group Discussion consisting of the four young men and women groups (20-35 years) and the four older men and older women groups (35 years and above) which amount to sixteen (16) clients. Those groups were chosen as they were more likely to bear common characteristics in relation to the nutritional intake and lifestyles thus it would be easier to put the question to clients within the specific groups. The transcribing of the exercise was done by the interviewer at the end of exercise. This was established to take place on two days and the interviewers performed two FGDs in a day.

Nutritional intervention package.

The intervention package that was administered to experimental group did little dispel of two phases. These include personalized diets of all patients with type 2 diabetes in addition to nutritional education and counseling that is based on the change of the lifestyle of affected diabetes patients.

Table 2.1: The intervention study's lectures for 3 months

MONTHS	SESSIONS	TOPICS
1	1 st and 2 nd	overview of diabetes mellitus, basic concept of diabetes (the risk factors, diagnosis, signs and symptoms, causes, complications, treatment, prevention, Introduction of food types and food groups, importance of foods, benefits of adequate feeding pattern practice and principles of nutrition therapy.
2	3 rd and 4 th	Education on traffic light diet guide which includes: eating an adequate diet, how to reduce unhealthy eating habit, how to replace foods not recommended for people living with diabetes with recommended foods, how to Prepare and cook healthy foods, how to keep a healthy weight, how to stay physically active with 30 mins moderate exercise. How to avoid sugar and saturated fats, food models, food portion size, meal plan and label reading were also educated.
3	5 th and 6 th	Adherence to dietary recommendation and regimen, development of a healthy eating plan, individualized diet, counseling, reinforcing the concepts of controlling portion sizes of foods, carbohydrate counting and clinical monitoring of the glycemic changes. They had access to individualized nutrition counselling and meal plan. Patients received a written educational material that serve as a guide to help with their practical management

Patients in their usual care armed/control group received normal routine clinic's counselling as to how he/she is practicing in their daily life such as the general knowledge on diabetes disease process, blood glucose monitoring, a healthy lifestyle, developing a personalized strategies for the decision making process. The traffic light diet was formulated, as well as the Red, Yellow and Green colour system originally created by Leonard Epstein to control pre-teen obesity (Goldfield, G.S., as well as Epstein, L.H., 2002) and under the background of the pattern of consuming

food in Nigeria among the recipients with type 2 diabetes. The Food groups in the Traffic Light Diet were assigned colour of a traffic light. **RED light** (Stop and think): fat, processed meat, cake and sugar beverages. **YELLOW light** (are good but are only supposed to be taken sparingly): whole grains, lean meat, poultry, fish and shellfish, nuts, eggs and good oil. **GREEN light** (go, low in calories and high in nutrients): beans, water, fruits, vegetables and low fat dairy. The Traffic Light Diet guide was provided to patients with type 2 diabetes to enable them to choose healthier foods (Huaqing *et al.*, 2015). At the conclusion of the intervention session, the researcher (dietitian) gave them a material of a diet guide in diabetes that would serve them as a guide at home. The educational session was taken in form of lectures, group discussion and sometimes individual consultations/diet plan.

Ethical approval

Upon approval from University of Port Harcourt ethics committee with the reference number of UPH/CEREMAD/REC/MM91/011, the proposal was approved by the ethical review committees of University of Port Harcourt Teaching Hospital (UPTH) with the reference number of UPTH/ADM/90/S.B/VOL.XI/1636 and Rivers State University Teaching Hospital (RSUTH) with reference number of RSUTH/REC/2023403. Permission was obtained from the head of the endocrinology department, as well as chief matron in charge in medical out-patients clinic and nurses on duty.

Informed consent was also acquired from every prospective participant in the study. **Confidentiality:** Information was treated with the utmost confidentiality. Privacy was ensured in health matters. No Risk was foreseen in carrying out the study.

Data Management

Instrument validity/ instrument reliability.

Ten type 2 diabetic patients in UPTH were the subjects of the pretest questionnaire. The pretesting was done to identify how the questions would pass with the respondents and there was no ambiguities.

Method of Data analysis plan

Data entry plan: Data were entered into a computer software and analysis was done using SPSS Version 25 statistical product and service solution.

Descriptive statistics: Participants' socio-demographic characteristics across the study groups at baseline and end line were analyzed using frequencies and percentages while continuous data was presented in means and standard deviations.

Inferential statistics: The knowledge score, biochemical parameters and the rate of change between the intervention and control group at baseline and end line level of the respondents were computed using mean and standard deviation.

The paired t-test was used to determine the difference between the intervention and control group of the knowledge score and biochemical parameters. Cohen's D statistical measure was used to calculate the effect size between 2 means group. A p-value less than or equal to 0.05 was considered significant for all statistics tests.

Conflict of interest: The author has no conflict of interest to disclose.

Funding: No funding was received.

3.0 RESULTS

Table 3.1: Socio-demographic characteristics at the baseline level in the control and intervention group

Characteristics	Control (n=79)		Intervention (n=79)		P-value
Age (years)	Freq	%	Freq	%	

20-40	4	5.1	17	21.5	0.252
41-60	49	62	39	49.4	
Above 60	26	32.9	23	29.1	
Gender					
Male	35	44.3	42	53.2	0.066
Female	44	55.7	37	46.8	
Marital status					
Single	10	12.7	9	11.4	0.397
Married	60	75.9	57	72.2	
Divorced	3	3.8	4	5.1	
Widowed	6	7.6	9	11.4	
Place of Residence					
Port harcourt	47	59.5	29	36.4	0.002
Obio/Akpor	32	40.5	50	63.3	
Occupation					
Teacher	7	8.9	9	11.4	0.118
Applicant	5	6.3	2	2.5	
Student	1	1.3	8	10.1	
Civil servant	16	20.3	19	24.1	
Farmer	11	13.9	18	22.8	
Trader	39	49.4	23	29.1	
Education					
Primary education	13	16.5	14	17.7	0.281
Secondary education	30	38	24	30.4	
Tertiary education	35	44.3	33	41.8	
No education	1	1.3	8	10.1	
Family size					
1-2	7	8.8	2	2.5	0.534
3-4	25	31.7	34	43.1	
5-6	25	31.7	30	38.0	
7 and above	22	27.9	13	16.5	
Income (000 naira)					
10-40	21	26.6	22	27.8	0.946
41-80	27	24.2	25	31.6	
81-120	12	15.2	12	15.2	
Above 120	19	24.1	20	25.3	
Religion					
Christian	78	98.7	79	100	0.230
Muslim	1	1.3	0	0	

There was no difference between the socio-demographic characteristics of the respondents in the control group and in the intervention group ($p>0.005$). However, the place of residence of the respondents in the control group and intervention group are statistically significant ($p<0.005$).

Table 3.2: Socio-demographic characteristics at the end line level in the control and intervention group

Characteristics	Control (n=79)	Intervention (n=79)	P-value
-----------------	----------------	---------------------	---------

Age (years)	Freq	%	Freq	%	
20-40	4	5.1	17	21.5	0.252
41-60	49	62	39	49.4	
Above 60	26	32.9	23	29.1	
Gender					
Male	35	44.3	42	53.2	0.066
Female	44	55.7	37	46.8	
Marital status					
Single	10	12.7	9	11.4	0.397
Married	60	75.9	57	72.2	
Divorced	3	3.8	4	5.1	
Widowed	6	7.6	9	11.4	
Place of Residence					
Port Harcourt	47	59.5	29	36.4	0.002
Obio/Akpor	32	40.5	50	63.3	
Occupation					
Teacher	7	8.9	9	11.4	0.118
Applicant	5	6.3	2	2.5	
Student	1	1.3	8	10.1	
Civil servant	16	20.3	19	24.1	
Farmer	11	13.9	18	22.8	
Trader	39	49.4	23	29.1	
Education					
Primary education	13	16.5	14	17.7	0.281
Secondary education	30	38	24	30.4	
Tertiary education	35	44.3	33	41.8	
No education	1	1.3	8	10.1	
Family size					
1-2	7	8.8	2	2.5	0.534
3-4	25	31.7	34	43.1	
5-6	25	31.7	30	38.0	
7 and above	22	27.9	13	16.5	
Income (000 naira)					
10-40	21	26.6	22	27.8	0.946
41-80	27	24.2	25	31.6	
81-120	12	15.2	12	15.2	
Above 120	19	24.1	20	25.3	
Religion					
Christian	78	98.7	79	100	0.230
Muslim	1	1.3	0	0	

No difference was found in the socio-demographic variables of the respondents in the control group and in the intervention group ($p>0.005$). The location of the respondents in the control group and intervention group, however, is statistically significant ($p<0.005$).

Table 3.3: Diabetes knowledge of the respondents at baseline and end-line level in control group

Knowledge questions	Control baseline	Control endline
Mean diagnosis age (year)	7.39±6.92	7.39±6.92
Knowledge score		
Poor (0-49)	45(57%)	45(57%)
Fair (50-69)	29(37%)	28(35%)
Good (70-100)	5(6%)	6(8%)
Mean knowledge score	47.08±12.94	47.19±12.85
Diabetes can be managed through		
Medication and drugs	19 (24.1)	19 (24.1)
Diet therapy only	7(8.9)	7(8.9)
Exercise medication and diet	45 (57)	45 (57)
Alteration medicine	0(0)	0(0)
All of the above	8(10.1)	
Have you been counseled about your diet, since after diagnosis?		
Yes	53(67.1)	53(67.1)
No	26(32.9)	26(32.9)
If yes, who did the counselling?		
Relation/neighbour	4(5.1)	4(5.1)
Doctor	13(16.5)	13(16.5)
Nurse	12(15.2)	12(15.2)
Dietitian	28(35.4)	28(35.4)
Do you think that modifying your diet will help you on the management		
Yes	78(98.7)	78(98.7)
No	1(1.3)	1(1.3)
Do you feel adequate dietary management will help you avoid future diabetic complications?		
yes	77(97.5)	77(97.5)
No	2(2.5)	2(2.5)
Do you encounter any difficulty complying with your diet?		
Yes	44(55.7)	44(55.7)
No	35(44.3)	35(44.3)
On a scale of 1-5, rate how important you think diet is in the treatment of diabetes.		
No opinion	2(2.5)	2(2.5)

Not important	1(1.3)	1(1.3)
Not very important	2(2.5)	2(2.5)
Quite important	43(54.4)	43(54.4)
Very important	31(39.2)	31(39.2)
Please rate how easy it is for you to adhere strictly to your dietary regimen		
No opinion	3(3.8)	3(3.8)
Not difficult	4(5.1)	4(5.1)
Quite difficult	24(30.4)	24(30.4)
Quite easy	0(0)	0(0)
Very easy	19(24.1)	19(24.1)
Are you satisfied with the quantity of food you were told to eat?		
Yes	39(49.4)	39(49.4)
No	40(50.6)	40(50.6)
Do you think you have enough information about dietary management and other aspects of management of diabetes?		
Yes	33(41.8)	33(41.8)
No	46(58.2)	46(58.2)
Diabetes mellitus can cause medical problem on the following part of the body; heart, eye, kidney, skin, gum etc.		
True	79(100)	79(100)
False	0(0)	0(0)
What meals do you take every day?		
Breakfast		
Everyday	78(98.7)	78(98.7)
Someday	1(1.3)	1(1.3)
Lunch		
Everyday	50(63.3)	78(98.7)
Someday	29(36.7)	1(1.3)
Never	0(0)	0(0)
Dinner		
Everyday	72(91.1)	72(91.1)
Someday	7(8.9)	7(8.9)
Never	0(0)	
Snacks		
Everyday	30(38)	72(91.1)
Someday	35(44.3)	7(8.9)
Never	14(17.7)	0(0)
How often do you skip meals a day?		
Occasionally	31(39.2)	30(38)
Sometimes	34(43)	35(44)
Frequently	2(2.5)	14(17.7)
Never	0(0)	0(0)
Why?		
No one to cook	1(1.3)	31(39.2)

Cannot afford it	28(35.4)	34(43)
I formed a habit	67(84.8)	2(2.5)
Do not skip	12(15.2)	12(15.2)
What is your eating habit like?		
3 square meals	41(51.9)	13(16.5)
Don't feel hungry	6(7.6)	38(48.1)
Extra snack	0(0)	28(35.4)
I starve	1(1.3)	0(0)
2 meals daily	31(39.2)	0(0)

In the control group, the mean knowledge score was 47.08 ± 12.94 at baseline and 47.19 ± 12.85 at end line level. Fifty-seven percent had poor knowledge at baseline and at endline. The mean diagnosis age of the respondents in the control group was 7.39 ± 6.92 years. More than half (67.1%) of the respondents in the control group had received dietary counselling since after diagnosis at baseline and endline. Less than half (35.4) of the respondents had received dietary counselling from a dietitian and 98.7% believed that dietary modification could improve management at baseline and endline. In the intervention group, 84.8% of the respondents had received dietary counselling since after diagnosis at baseline but at endline, all of them had received dietary counselling.

Table 3.4: Diabetes knowledge of the respondents at baseline and end-line level in the intervention group

Knowledge questions	Intervention baseline	Intervention endline
Mean diagnosis age (year)	7.59 ± 6.33	7.59 ± 6.33
Knowledge score		
Poor (0-49)	38(48%)	0(0)
Fair (50-69)	25 (32%)	23(29%)
Good (70-100)	16(20%)	56(71%)
Mean knowledge score	50.71 ± 15.5	74.6 ± 11.24
Diabetes can be managed through		
Medication and drugs	11(13.9)	0(0)
Diet therapy only	3 (3.8)	0(0)
Exercise medication and diet	44(55.7)	79(100)
Alteration medicine	2(2.5)	0(0)
All of the above	19(24.1)	
Have you been counseled about your diet, since after diagnosis?		
Yes	67(84.8)	79(100)
No	12(15.2)	0(0)
If yes, who did the counselling?		
Relation/neighbor	6(7.6)	0(0)

Doctor	32(40.5)	0(0)
Nurse	4(5.1)	0(0)
Dietitian	36(45.6)	79(100)
Do you think that modifying your diet will help you on the management		
Yes	75(94.9)	79(100)
No	4(5.1)	0(0)
Do you feel adequate dietary management will help you avoid future diabetic complications?		
yes	74(93.7)	79(100)
No	5(6.4)	0(0)
Do you encounter any difficulty complying with your diet?		
Yes	48(60.8)	0(0)
No	31(39.2)	79(100)
On a scale of 1-5, rate how important you think diet is in the treatment of diabetes.		
No opinion	6(7.6)	0(0)
Not important	3(3.8)	0(0)
Not very important	0(0)	0(0)
Quite important	39(49.4)	43(54.5)
Very important	31(39.2)	36(45.6)
Please rate how easy it is for you to adhere strictly to your dietary regimen		
No opinion	6(7.6)	0(0)
Not difficult	5 (6.3)	0(0)
Quite difficult	40(50.6)	9(11.4)
Quite easy	0(0)	32(40.5)
Very easy	14(17.7)	38(48.1)
Are you satisfied with the quantity of food you were told to eat?		
Yes	49(62)	79(100)
No	30(38)	0(0)
Do you think you have enough information about dietary management and other aspects of management of diabetes?		
Yes	23(29.1)	70(88.6)
No	56(70.9)	9(11.4)
Diabetes mellitus can cause medical problem on the following part of the body; heart, eye, kidney, skin, gum etc.		
True	73(92.4)	79(100)
False	6(7.6)	0(0)
What meals do you take every day?		
Breakfast		
Everyday	59(74.7)	79(100)
Someday	20(25.3)	0(0)
Lunch		

Everyday	39(49.4)	75(94.9)
Someday	40(50.6)	3(3.8)
Never	0(0)	1(1.3)
Dinner		
Everyday	61(77.2)	78(98.7)
Someday	17(21.5)	1(1.3)
Never	1(1.3)	
Snacks		
Everyday	32(40.5)	22(27.8)
Someday	41(51.9)	47(59.5)
Never	6(7.6)	10(12.7)
How often do you skip meals a day?		
Occasionally	37(46.8)	3(3.8)
Sometimes	22(27.8)	1(1.3)
Frequently	6(7.6)	0(0)
Never	0(0)	75(94.9)
Why?		
No one to cook	10(12.7)	0(0)
Cannot afford it	8(10.1)	0(0)
I formed a habit	61(77.2)	0(0)
Do not skip	0(0)	79(100)
What is your eating habit like?		
3 square meals	48(60.8)	75(94.9)
Don't feel hungry	6(7.6)	0(0)
Extra snack	3(3.8)	0(0)
I starve	3(3.8)	0(0)
2 meals daily	19(24.1)	4(5.1)

The baseline level of knowledge was 50.71 ± 15.5 in the intervention group. Mean age of diagnosis was 7.59 ± 6.33 at baseline and end line level. At baseline, majority (92.4) were of the opinion that diabetes can cause medical complications but at endline, all the respondents thought that diabetes can cause medical complication. This is because at baseline, 74.7% of them had breakfast daily, 50.6% of them had lunch on some days, 84.8% of them had dinner daily and 51.9% of them had snacks on some days. All respondents had breakfast and dinner daily, lunch daily and snacks some days at endline. At baseline, 46.8% sometimes missed meals but at endline, 94.9% did not miss meals at all. At the baseline, 60.8 per cent consumed 3 square meals but at endline, 94.9 per cent consumed 3 square meals. The endline knowledge was 74.6 ± 11.24 .

Table 3.5: Changes in diabetes knowledge of the respondents in both groups at baseline and end line level.

Knowledge score	Control group	Intervention group	Cohen's d
Mean and SD	47.19±12.85	74.6±11.24	2.27
Knowledge questions	Change in control group		Chang in Intervention group
Diabetes can be managed through			
Medication and drugs	0		13.9
Diet therapy only	0		3.8

Exercise medication and diet	0	44.3
Alteration medicine	0	2.5`
All of the above	0	24.1
Have you been counseled about your diet, since after diagnosis?		
Yes	0	15.2
No	0	15.2
If yes, who did the counselling?		
Relation/neighbour	0	7.6
Doctor	0	40.5
Nurse	0	5.1
Dietitian	0	54.4
Do you think that modifying your diet will help you on the management		
Yes	0	5.1
No	0	5.1
Do you feel adequate dietary management will help you avoid future diabetic complications?		
yes	0	6.3
No	0	6.4
Do you encounter any difficulty complying with your diet?		
Yes	0	60.8
No	0	60.8
On a scale of 1-5, rate how important you think diet is in the treatment of diabetes.		
No opinion	0	7.6
Not important	0	3.8
Not very important	0	0(0)
Quite important	0	5.1
Very important	0	6.4
Please rate how easy it is for you to adhere strictly to your dietary regimen		
No opinion	0	7.6
Not difficult	0	6.3
Quite difficult	0	39.2
Quite easy	0	40.5
Very easy	0	30.4
Are you satisfied with the quantity of food you were told to eat?		
Yes	0	38
No	0	38
Do you think you have enough information about dietary management and other aspects of management of diabetes?		
Yes	0	59.5

No	0	59.5
Diabetes mellitus can cause medical problem on the following part of the body; heart, eye, kidney, skin, gum etc.		
True	0	7.6
False	0	7.6
What meals do you take every day?		
Breakfast		
Everyday	0	25.3
Someday	0	25.3
Lunch		
Everyday	35.4	45.5
Someday	35.4	46.8
Never	0	1.3
Dinner		
Everyday	0	21.5
Someday	0	20.2
Never	0	1.3
Snacks		
Everyday	53.1	12.7
Someday	35.4	7.6
Never	17.7	5.1
How often do you skip meals a day?		
Occasionally	1.2)	43
Sometimes	1	26.5
Frequently	15.2	7.6
Never	0	94.9
Why?		
No one to cook	37.9	12.7
Cannot afford it	7.6	10.1
I formed a habit	82.3	77.2
Do not skip	0	100
What is your eating habit like?		
3 square meals	35.4	34.1
Don't feel hungry	40.5	7.6
Extra snack	35.4	3.8
I starve	1.3	3.8
2 meals daily	39.2	19

The difference in the change of the diabetes knowledge between the respondents of the intervention group (Cohen $d=2.27$, 95% CI (23.31, 31.57), $p < 0.05$) and the control group was extremely significant, which demonstrated the extremely significant effect size of the intervention on diabetes knowledge compare to control group.

Table 3.6: Biochemical characteristics of the respondents in the control group at baseline and endline level

Characteristics	Control group Baseline	Control group Endline	P-value
-----------------	---------------------------	--------------------------	---------

Biochemical characteristics			
Fasting blood sugar	7.85±2.85	7.65±2.69	0.203
Random blood sugar	13.45±9.17	14.23±11.83	0.392
LDL	3.46±0.49	3.44±0.49	0.071
HDL	1.06±0.41	1.05±0.41	0.769
Total cholesterol	4.96±0.89	4.94±0.87	0.726
Total triglycerides	2.23±0.81	2.13±0.84	0.037
HBA1c (%)	9.89±3.31	10.36±3.13	0.058
Systolic BP	143.2±22.75	145.71±23.13	0.096
Diastolic BP	90.19±15.43	92.19±16.02	0.026

There was no significant difference between biochemical parameters at baseline and at endline in the control group ($p>0.05$).

Table 3.7: Biochemical characteristics of respondents in intervention group at baseline and endline level

Characteristics	Intervention group Baseline	Intervention group Endline	P-value
Biochemical characteristics			
Fasting blood sugar	7.77±3.39	4.66±0.79	0.000
Random blood sugar	12.19±5.39	7.01±1.18	0.000
LDL	2.84±0.75	2.71±0.35	0.473
HDL	1.06±0.47	1.01±0.19	0.125
Total cholesterol	5.15±1.08	4.24±0.73	0.000
Total triglycerides	1.81±0.74	1.79±0.25	0.000
HBA1c (%)	9.78±2.14	6.16±0.70	0.000

Systolic BP	142.63±16.41	136.79±14.92	0.244
Diastolic BP	89.08±10.41	89.34±9.59	0.285

In the intervention group, there was significant difference between FBS, RBS, Total Cholesterol, HbA1c at baseline and end line ($p < 0.05$). However there was no significant difference between the LDL, HDL, total triglycerides, systolic and diastolic BP at baseline and end line ($p > 0.05$).

Table 3.8: Changes in biochemical characteristics of the respondents at baseline and endline level in both groups

Characteristics	Control group	Intervention group	Cohens d
Biochemical characteristics			
Fasting blood sugar	7.65±2.69	4.66±0.79	1.51
Random blood sugar	14.23±11.83	7.01±1.18	0.86
LDL	3.44±0.49	2.71±0.35	1.71
HDL	1.05±0.41	1.01±0.19	0.18
Total cholesterol	4.94±0.87	4.24±0.73	0.87
Total triglycerides	2.13±0.84	1.79±0.25	0.55
HBA1c (%)	10.36±3.13	6.16±0.70	1.85
Systolic BP	145.71±23.13	136.79±14.92	0.65
Diastolic BP	92.19±16.02	89.34±9.59	0.67

The intervention group showed significantly improved outcomes in FBS (Cohen's $d = 1.51$, 95% CI (2.36, 3.64), $p < 0.05$) LDL (Cohen's $d = 1.71$, 95% CI (0.58, 0.88), $p < 0.05$), HBA1c (Cohen's $d = 1.85$, 95% CI (3.41, 4.9), $p < 0.05$), RBS (Cohen's $d = 0.86$, 95% CI (4.53, 10.02), $p < 0.05$), total cholesterol (Cohen's $d = 1.71$, 95% CI (0.47, 0.89), total triglycerides (Cohen's $d = 0.55$, 95% CI (0.16, 0.52), $p < 0.05$), systolic BP (Cohen's $d = 0.65$, 95% CI (2.73, 14.84), $p < 0.05$) and diastolic BP (Cohen's $d = 0.67$, 95% CI (-1.26, 7.03), $p > 0.05$) of the respondents in the post intervention compared with the control group, indicating moderate to very large effect size.

Table 3.9: Traffic light diet Effect of Traffic Light Diet Nutrition Intervention on knowledge of food choices

Traffic Light Diet	Mean	SD	Pearson r	p-value
baseline	62.15	13.27	0.471	0.000
endline	74.68	9.45		

The impact of the nutrition intervention is shown in Table 3.9. The intervention had a moderate effect on the respondents' knowledge of food choices and was statistically significant in improving their understanding of food choices ($r=0.471$, $p=0.000$).

4.0 DISCUSSION OF FINDINGS

The mean age of the respondents in control group and intervention group fell between the 41-60 years 49(62) and 39(49.4) respectively. The results of this study was identical to that of the same study carried in Nepal, with age bracket of greatest age in the control and intervention group being 50- 65 years and 35 -44 years respectively with representations of 45(57.7) and 35 (44.9) respectively. Again, the IDF atlas (2021) by adjacent IDF/ WHO indicate that 537 million adult population 20 to 79 years has diabetes - 1 in 10. Similar to this study, it was also established that females predominated in the control group 44(55.7) and males in intervention group 42(53.2) predominated. It may be attributed to the fact that female would demand medical attention as compared to their male counterparts. The major respondents in the control group 78(98.1) and intervention group 79 (100) were mostly Christians with the rest of other religions (1.3%). This is the case as Port Harcourt is also a Christians dominated state as well as the Rivers state and that despite the large number of the inhabitants in this state, majority of the inhabitants are Christians. The range of numbers in 34.2% earning 41,000 naira -80,000 naria was just slightly above the minimum wages and minus the tax paid on this amount will definitely lead to a situation whereby this amount of money cannot buy drugs and place good food on the table. The results of this study are dissimilar to the results of Sunuwar *et al.* (2023) in the income status. Majority of the respondents had poor knowledge in regard to nutrition and general diabetes knowledge at baseline and at end line level in the control group while in the intervention group seventy-four point six percent had good knowledge at the end line level which shows that the control group respondents were not lectured or advised on diabetes. They followed the routine care giving in the hospital facility while the intervention group were extremely educated, lectured and advised on the need of appropriate diabetes management and how to make the right food choices. ***According to focus group discussion of this study, it was discovered that the participants have moderate knowledge in regard to nutrition. They believed that diet will help them to management their diabetes well.***

The result of this study was contrary to the findings of Sunuwar *et al.* (2023) which shows that the diabetes knowledge score among the control group is a slight higher 14.92(5.12) than in the intervention group 14.28(5.73). The change in diabetes knowledge among the intervention group at endline level showed extremely significant difference and high effect size in knowledge of the respondents (Cohen's $d=2.27$, 95% CI (23.31, 31.57), $p < 0.05$), compared with the control group at baseline and endline level. The result of this study was in line with the finding from Huaqing *et al.* (2015) that after intervention follow-up and dietary counseling, the knowledge of the respondents in the intervention group increase. The biochemical assessment of this study proved to be higher at the baseline and endline level in control group (7.65 ± 2.69 mmol/l) and decreased in endline level in the intervention group (4.66 ± 0.79 mmol/l) parameter of fasting blood sugar. This has been revealed that dietary intervention mediated by dietitians has been successful at reducing FBS, RBS, Total cholesterol and HbA1c level of the respondents at endline in the intervention group compare to control group. This present results matched a research by Akine *et al.* (2023). They found that the mean test of fasting glucose of the intervention group was low (4.66 ± 0.79 mmol/l) and that of the control group was high 186.64 ± 54.95 mg/dl. In the change between intervention and control group at baseline and endline level, the intervention group showed significantly improved outcomes in FBS (Cohen's $d=, 1.51$, 95% CI (2.36, 3.64), $p < 0.05$) LDL (Cohen's $d=, 1.71$, 95% CI (0.58, 0.88), $p < 0.05$), HBA1c (Cohen's $d=, 1.85$, 95% CI (3.41, 4.9), $p < 0.05$), RBS (Cohen's $d=, 0.86$, 95% CI (4.53, 10.02), $p < 0.05$), total cholesterol (Cohen's $d=, 1.71$, 95% CI (0.47, 0.89), $p < 0.05$), total triglycerides (Cohen's $d= 0.55$, 95% CI (0.16, 0.52), $p < 0.05$), systolic BP (Cohen's $d=0.65$, 95% CI (2.73, 14.84), $p < 0.05$) and diastolic BP (Cohen's $d= 0.67$, 95% CI (-1.26, 7.03), $p > 0.05$) of the respondents compared with the control group, indicating moderate to very large effect size. After the intervention follow-up and dietary counseling, the knowledge of the respondents increase. The intervention had a moderate effect on the respondents' knowledge of food choices in regard of traffic light diet guide and was statistically significant in improving their understanding of food choices ($r=0.471$, $p=0.000$). This beneficial effect of intervention may be a result of attention to the diet guide of traffic light diet, which might promote positive behaviors of diabetic subjects, and not directly related to the diet. The TLD guide is provided to patients with type 2 diabetes in the present study really help them

make healthier food choices. The positive effect of Traffic light diet in the intervention group of this present study correspond with a study done in China by Huaqing *et al.* (2015).

5.0 CONCLUSION

This study concluded that dietitian-led dietary intervention was effective to improve the nutrition knowledge, general knowledge and glycemic control among the respondents. This is because, the intervention group were enrolled on nutrition education and counseling which emphasis on life style modification and they also had individual diet plan while the control group patients did not receive any specific intervention during follow-up. This study emphasizes the roles and importance of dietitians in managing diabetes in Port Harcourt, Nigeria's public and commercial hospitals

RECOMMENDATION

There is need to employ more dietitians at all levels of the health care to ensure all people with diabetes are provided with quality professional education on medical nutrition therapy upon diagnosis, and at regular intervals thereafter.

REFERENCES

Akine, E., Abera, L., Sadat, M., Sisay, S. & Yibeltal, A. (2023): Effect of nutrition promotion intervention on dietary adherence among type 2 diabetes patients in North Shoa zone Amhara region. *Journal Health, Popul and Nutr. BMC.*2023; 42:49. doi: 10.1186/s41043-023-00393-3.S60. <https://doi.org>.

American Diabetes Association (2021): Facilitating behavior change and well-being to improve health outcomes: Standards of medical care in diabetes-2021. *Diabetes Care* 2021, 44, S53–S72.

Antonio, B, Elena, G., Ilaria, D., Charan, J. & Biswas, T. (2013): How to calculate sample size for different study designs in medical research?. *Indian J Psychol Med*, 35:121-6.

Ayasa, N., Saeko, I., Shizuo, K., Mikuko, M., Takashi, M., Shinya, M., Shintaro, K., Yoshitaka, H., Neiko, O. & Michiaki, F. (2022): Impact of Dietitian-Led Nutrition Therapy of Food Order on 5-Year Glycemic Control in Outpatients with Type 2 Diabetes at Primary Care Clinic: Retrospective Cohort Study. *Nutrient*, 14, 2865. <https://doi.org/10.3390/nu14142865>

Garcia, A.A., Villagomez, E.T., Brown, S.A., Kouzekanani, K. & Hanis, C.L. (2001): The Starr county diabetes education study: development of the Spanish-language diabetes knowledge questionnaire. *Diabetes Care*.2001; 24:16–21.

Huaqing, L. M., Min, Z. M., Xuesen, W., Chunhua, W. & Zhong, L. (2015): Effectiveness of a public dietitian-led diabetes nutrition intervention on glycemic control in a community setting in China. *Asia Pac J Clin Nutr* 2015; 24 (3): 525-532.

International Diabetes Federation (2017). IDF Diabetes Atlas, 8th edn. Brussels, Belgium: International Diabetes Federation. Available from <http://www.diabetesatlas.org>. Accessed 14 Oct 2019.

International Diabetes Federation and DAR International Alliance (2021): Diabetes and Ramadan: Practical Guidelines, Brussels, Belgium: International Diabetes Federation, 2021.

International Diabetes Federation (2025). IDF Global clinical practice Recommendation for managing Type 2 Diabetes. <https://idf.org/t2d-cpr-2025>.

International confederations of Dietetic Association (2016): ICDA 3th edition

Mayo clinic (2022). Managing Type 2 diabetes mellitus. Mayo Foundation for Medical Education and Research. Moller, G., Andersen, H.K & Snorgaard, O. (2017): A systematic Review and Meta-analysis of Nutrition therapy compared with

dietary advice in patients with type 2 diabetes. *The American Journal of Clinical Nutrition*. Volume 106, Issue 6, 1394 – 1400.

Sunuwar, D.R., Nayaju, S., Raja Ram Dhungana, R.R., Karki, K., Pradhan, P.M.S., Poudel, P., Nepal, C., Thapa, M., Shakya, N.S., Sayami, M., Shrestha, P.K., Yadav, R & Singha, D.R. (2023): Effectiveness of a dietician-led intervention in reducing glycated haemoglobin among people with type 2 diabetes in Nepal: a single centre, open-label, randomised controlled trial. *THE LANCET Regional Health South East Asia*. Open Access Published: September 24, 2023 DOI:<https://doi.org/10.1016/j.lansea.2023.100285>.

World Health Organization. (2016). Diabetes country profile: Nigeria. World Health Organization. <https://www.who.int/publications/m/item/diabetes-nga-country-profile-nigeria-2016>