

Effect of Health Education Intervention Programme and Socio-Demographic Composite Factors on Practice of Dental Caries Prevention Strategies among Adults in, Kaduna State, Nigeria

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ABSTRACT

Background: Practice of the preventive strategies in dental caries has been a challenge for the population over a long period of time. A multifaceted approach, the involvement of all dentists, health educators, and policy makers, as well as research studies that evaluate the results of the paradigm of caries prevention strategies and adjust it as necessary are all necessary for moving forward with practice and implementation.

Methods: This study adopted a quasi-experimental research design using a pre-test-post-test control group design. The sample size for this study consists of sixty (60) adults (male and female) that will be drawn from population of Zaria metropolis in Kaduna State, Nigeria. A multi-stage sampling technique was used. The instrument that was used for data collection in this study was a researcher-structured close-ended questionnaire.

Results: The effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria posttest is significant ($p = 0.000$). The effect between demographic characteristics (age and marital status) and health education intervention programme on practice of dental caries prevention strategies among adult of in Zaria metropolis Kaduna State, Nigeria ($p = 0.000$).

Conclusion: Tailor the intervention materials to address the unique needs and learning preferences of different age groups and marital statuses to maximize engagement and effectiveness. Integrate this effective intervention as part of routine public health education efforts to promote sustained dental caries prevention.

Keywords: Practice, Dental caries, Age, Marital Status, Intervention

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INTRODUCTION

Dental caries is regarded as a chronic disease capable of altering normal physiological functions across all stages of life. The term “caries” refers both to the disease process and the resulting destruction caused by the disease process itself.¹ Dental caries remains one of the most prevalent oral diseases globally and is described as a multifactorial oral disease initiated by acid-producing bacteria that attack and destroy the hard tissues of the teeth. This condition may also be explained as a microbial imbalance within the oral cavity associated with factors such as saliva composition, fluoride exposure, and dietary habits.² Dental caries further refers to the signs, symptoms, and consequences of localized chemical demineralization of mineralized tooth surfaces initiated by metabolic activities occurring within dental plaque biofilms covering the affected teeth surfaces.³

The Global Burden of Disease study estimated that the prevalence of untreated dental caries declined by only 4% globally over the last decade, indicating that the remarkable reduction observed during the previous three decades has slowed considerably. Dental caries has also been associated with loss of school and work days, thereby affecting productivity and quality of life.⁴ According to the World Health Organization (WHO), oral diseases affect nearly 3.5 billion adults worldwide, with approximately three out of every four affected individuals residing in middle-income countries.⁵

In developed countries, the prevalence of dental caries has gradually declined due to improved dental facilities, greater awareness of oral hygiene, and increased access to preventive oral healthcare services. However, developing countries continue to experience increasing prevalence of dental caries due to rising consumption of sugary foods, poor oral hygiene practices, and inadequate dental healthcare services. In sub-Saharan Africa, the prevalence of dental caries differs across population groups and socioeconomic classes. Prevalence rates of 40.98% in Ethiopia, 52.4% in Sudan, 50.3% in Kenya, and 40.2% in Tanzania have been reported.⁶ In Nigeria, dental caries prevalence ranges between 4% and 40%, while the mean Decayed, Missing, and Filled Teeth (DMFT) index ranges from 0.5 to 3.5. Existing data are largely derived from adults attending dental hospitals for treatment.⁷

The practice of preventive strategies against dental caries has remained a major challenge among many populations over time. Effective prevention requires

a multifaceted approach involving dentists, health educators, policymakers, and researchers in order to evaluate preventive strategies and modify them where necessary. Failure to practice preventive dental care may result in more complicated and expensive treatment procedures. Untreated dental caries can also lead to pain, discomfort, difficulty in eating, and reduced quality of life.⁸

The practice of dental caries prevention strategies remains a serious public health concern because many adults fail to adequately adopt preventive oral health behaviours. Although awareness regarding dental hygiene and preventive measures may exist, such knowledge does not always translate into actual practice. Preventive practices such as regular tooth brushing, flossing, use of fluoride products, and routine dental visits are often inconsistently practiced. This poor adherence is influenced by several factors including socioeconomic status, accessibility of dental services, cultural beliefs, educational background, and individual attitudes toward oral health. Consequently, inadequate practice of preventive measures contributes significantly to the increasing burden of dental caries within communities.

Dental caries continues to constitute a significant public health challenge in Zaria Metropolis, Kaduna State, where many adults demonstrate inadequate preventive practices and limited oral health awareness. The observed gap in preventive practices and oral health behaviour motivated the researcher to investigate the effect of health education intervention programme on preventive strategies for dental caries among adults in the study area. The study therefore sought to address the perceived deficiencies in knowledge and practice relating to dental caries prevention strategies among adults in Zaria Metropolis.

MATERIALS AND METHODS

Research Design

This study adopted a quasi-experimental research design using a pre-test-post-test control group design. Quasi-experimental design aims at establishing a cause-and-effect relationship between independent and dependent variables without the use of random assignment of participants.⁹ Participants are assigned into study groups based on non-random criteria rather than true randomization. Rogers and Revesz¹⁰ explained that pre-test-post-test control group designs are appropriate for investigating the effects of educational interventions

and are widely utilized in educational and health-related research.

In this design, two groups of adults were selected and assigned into experimental and control groups. Both groups were initially exposed to a pre-test before the introduction of the intervention programme to the experimental group. After the intervention period, a post-test was conducted for both groups to determine the effect of the intervention. This design was considered suitable for the present study because it enabled the researcher to assess the effect of health education intervention programme on the knowledge, attitude, and practice of dental caries prevention strategies among adults in Zaria Metropolis, Kaduna State, Nigeria.

Population of the Study

The population for the study consists the entire Adult across, Kaduna State. Zaria metropolis comprises of two local government which are; Zaria and Sabon-Gari LGA. The census population of Zaria LGA is 406,990 and Sabon-Gari 291,358 (National Population Commission, 2006). The current estimated population in 2022 at a 2.5% annual increase is 601,300 and 430,500 for Sabon-Gari and Zaria LGA respectively. With these the estimated total population for the area of study will be 1,031,800, which is the total population for Zaria Metropolis. The study is design to determining the effect of health education intervention programme on knowledge, attitude and practice on dental caries prevention strategies among adult in Kaduna state.

Sample and Sampling Procedure

The sample size for this study consists of sixty (60) adults (male and female) that will be drawn from population in Kaduna State, Nigeria. This selection relies on Cohen and Manion (2001), suggestion that a minimum of twenty (20) participants are required for experimental research to produce a desirable effect. Therefore, for the purpose of this study, sixty (60) participants was the sample size, thirty (30) experimental group and thirty (30) control group for the purpose of generalization. A multi-stage sampling technique was used that involve the follows;

Stage I: Stratified sampling technique was used for stratification of the Kaduna State into the three already senatorial zones (Kaduna North, Kaduna South and Kaduna Central). Kaduna State was selected for the study.

Stage II: Purposive sampling technique was used for Zaria Metropolis from Kaduna North senatorial zone.

Stage III: Stratified sampling technique was used for stratification of the Zaria metropolis into the two already existing local government areas (Zaria and Sabon Gari LGAs). Both Local Government Areas were selected for the study.

Stage IV: Simple random sampling technique of fishbowl method was used to select four wards (4), two (2) wards each Local Government Area within Zaria metropolis. Two containers were used each one representing a local government. The name of the each ward was written on a piece of paper, folded and dropped into the corresponding container. The four selected wards are; Tudun-Wada, Kwarbai 'A', Bomo and Jama'a.

Stage V: Purposive sampling was used to form participants of the two (2) groups for the study which are experimental and control group, selecting across both Local Governments Area within the metropolis. Jama'a and Tudun Wada wards from Sabon Gari and Zaria L.G.A respectively serve as control group while Bomo and Kwarbai 'A' Wards from Sabon Gari and Zaria L.G.A respectively serve as experimental group. The two wards each are allocated with 30 participants making the total sample size 60 adults in Zaria Metropolis.

Stage VI: A Systematic sampling was used to select adults in the sampled wards. In this procedure all available adults where be seated at the venue. The total population present where divided by the sample size. With this the interval of sample was identified and use to select the respondent. This procedure was used for both the experimental and control group. This technique was used to give equal chance of selection among all respondent. This was done to give equal chance to everyone.

Both experimental and control groups where pre-tested (O_1) on performance before the administration of treatment. The treatment (X_1) was administered to the experimental group (EG) on health education intervention programme on knowledge, attitude and practice of dental caries prevention strategies, while the control group (CG) will not receive any intervention on health education programme on practice of dental caries prevention strategies, (thus, no treatment (X_0)). The control group was provided with a placebo on "Waste Management". The placebo is aimed at making them committed throughout period of the study. At the end of the six weeks' treatment, a post-test (O_2) was administered to the two groups to determine the respondent's practice of dental caries prevention strategies among adults in Kaduna State, Nigeria.

The inclusion criteria was adult's (male and female) settling within the study area. And their interest and consent to participate in the study. On the other hand, the exclusion criteria include absence for more

than two sessions during the educational intervention and not participating in posttest. The research design is presented in Figure 1



Figure 1: Research Design

Where: EG= Experimental Group, CG= Control Group, O₁= Pre-test, O₂= Post-test X₁= Treatment: (Health Education Intervention Programme on Practice of Dental Caries Prevention Strategies among Adults in Zaria Metropolis)

Instrument for Data Collection

The instrument that was used for data collection in this study is a researcher-structured close-ended questionnaire. The questionnaire was divided into four sections: Section A and B. Section A contains five (5) items on demographic characteristics of the respondents. Section B contains ten (10) items on practice of dental caries prevention strategies among adults.

Therefore, any mean score of response that is 2.5 or above is regarded as positive, while any mean score of response less than 2.5 will be regarded negative.

Validity of the Instrument

The researcher-developed instrument tagged "Effect of Health Education Intervention Programme on Practice on Dental Caries Prevention Strategies among Adult Questionnaire" (HEIPKAPDCPSAAQ) in Zaria metropolis Kaduna state. Four (4) copies of the instrument was given to four (4) experts in the Department of Human Kinetics and Health Education, Ahmadu Bello University, Zaria to check the appropriateness of instrument, whether it will actually measure what is expected to measure. The face and contents validity was checked.

Procedure for Data Collection

Letter of introduction will be collected from the Department of Human Kinetics and Health Education, Faculty of Education, Ahmadu Bello University, Zaria to be given to the ward heads to obtain permission to visit, conduct intervention and collect data from the adult of the sampled wards. The researcher will employ four trained research assistants from the wards and instruct them on various area of assisting. The researcher and his research assistants will proceed to each sampled wards to meet with Ward Head, Religious leaders and Head (in-charge) of the primary health care (PHC) facility for introduction on the research work. Religious leader will be requested to announce and invite participants from there congregation who are interested in participating for the research. Ward

heads will also be requested to invite interested adults within the community to participate in the research. Town criers and announces will be use in the community to invite adult for the study. These procedures will be applicable in all selected wards. The in-charge of the PHC will be requested to give permission to use the facility as a meeting point with respondents for intervention (lectures and experiment).

Furthermore, the researcher's second visit to the sampled wards will be to carry out the systematic sampling for participants on the number of adult that turn out for the research. This procedure will take place at the Local Government Educational Authority (LEA) Primary School of each selected ward. After the selection of samples at each ward, each L.G.A will have one control and one experimental group at different wards. During this visit a calendar for the intervention will be draft to suit availability of respondents to enable optimum participation within the span of six weeks.

More so, in these second visit it will involves the researcher selecting respondents based on the inclusion and exclusion criteria. Selected respondents from the study will involve participants from the two selected wards each. Name, address and phone number of all samples will be recorded for documentation and follow-ups. They will be notice of the venue for the intervention (treatment).

Health Educational Intervention Programme Phase

The health education intervention programme on dental caries prevention strategies will be implemented through teaching, instruction and demonstration in six sessions. A scheme of work and lesson plan has been plan and design to be use for the period of the intervention. The programme implementation will be for a period of 60 minutes per session. The six sessions will span for a period of six (6) weeks with each session taking place weekly. The researcher with four assistants will collect data from

the respondents in both control and experimental groups prior to the intervention at the first session.

Posttest (Post Intervention) Phase

While after the health education intervention programme data was collected from the control and experimental (treatment) group. Finally, to address the cues to action dimension of the HBM, the cell phone number of participants obtained during the first contact will be used to call and send a text message reminder every two weeks for two months after the intervention on the importance of preventive strategies for dental caries. Posttest data will be collected after eight (8) weeks from the intervention programme. The period of pretest and posttest data collection will be fourteen (14) weeks.

Procedure for Data Analysis

After collecting and sorting out copies of the questionnaire, a coding scheme was developed and each questionnaire was reviewed and coded into a computerized database using a Microsoft Excel spreadsheet. One sample and ANOVA was used to analyze the data generated for the study. A descriptive statistic of frequencies and percentages, mean and standard deviation was used to analyze the demographic characteristics of the respondents and research questions respectively.

One sample t-test was used to test the hypotheses 1 which are; the effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria is not significant at 0.05 level of significance.

While ANOVA was used to test Age and Marital status in hypothesis that there is no significant effect in demographic characteristics (age and marital status) and health education intervention programme on practice of dental caries prevention strategies among adult of in Zaria metropolis Kaduna State, Nigeria at 0.05 level of significance.

RESULTS

Descriptive analysis of the participants' socio-demographic characteristics

The total number of thirty (30) participants were selected from each of the group none of the participants in either groups could not meet all the required information. Therefore, thirty (30) participants each completed the study in the experimental and control group. Among the socio-demographic characteristics of the respondents selected for the analysis along their expressed responses were: age, gender, marital status, educational qualification, and occupation. These variables are categorized into ranges and presented in frequency and percentages in table 1

Table 1 showed that on age distribution for experimental group 18 – 24 Years has 9 (30.2%); 25 – 31 Years has 11(36.5%); 32 – 38 Years, has 6 (20%), 39 – 45 Years, has 3 (10%); and 46 – above has 1 (3.3%). Making the age distribution of 25-31 years to be higher while 46-above is lowest. For the control group 18 – 24 Years with 12 (40.0%) is the lower while 46 – above with no respondent. The distribution on gender showed in experimental group Male 16 (53.3%) while Female has 14 (46.7%) indicating that Male respondents are higher. In control group Male 13 (43.3%) while Female has 17 (56.7%) indicating that Female respondents are higher. The distribution on marital status showed that in experimental group; Married has 5 (16.7%), Divorced 7 (23.3%), widow has 4 (13.3%), and single has 14 (46.7%).

The distribution on educational qualification showed that in experimental group; Non-formal Education has 3 (10.0%), Primary Education 5 (16.7%), Secondary Education, 14 (46.6%); and Tertiary Education 8 (26.6%). Secondary Education has the highest frequency while non-formal education has the lowest. In control group Non-formal education has the lowest with 1 (3.4%) and Secondary Education has 15 (50.0%). The distribution on occupation showed that in experimental group; civil servant has 10 (33.3%), Farming has 8 (26.7%) and trading has 12 (40.0%). Trading has the highest frequency while farming has the lowest. In control group trading has the highest with 9 (63.4%) while farming is the lowest with 4 (13.3%).

Table 1 Participants' Socio-demographic Characteristics

	Variable Options	Experimental		Control	
		Freq.	Percent%	Freq.	Percent%
Age	18 – 24 Years	9	30.0	12	40.0
	25 – 31 Years	11	36.7	7	23.3
	32 – 38 Years	6	20.0	8	26.7
	39 – 45 Years	3	10.0	3	10.0
	46 – above	1	3.3	0	0.0
	Total	30	100.0	30	100.0
Gender	Male	16	53.3	13	43.3
	Female	14	46.7	17	56.7
	Total	30	100.0	30	100.0
Marital status	Married	5	16.7	9	30.0
	Divorced	7	23.3	6	20.0
	Widow	4	13.3	3	10.0
	Single	14	46.7	12	40.0
	Total	30	100.0	30	100.0
Educational Qualification	Non-formal Education	3	10.0	1	3.4
	Primary Education	5	16.7	7	23.3
	Secondary Education	14	46.7	15	50.0
	Tertiary Education	8	26.6	7	23.3
	Total	30	100.0	30	100.0
Occupation	Civil servant	10	33.3	7	23.3
	Farming	8	26.7	4	13.3
	Trading	12	40.0	19	63.4
	Total	30	100.0	30	100.0

Source: Field survey, 2024

What is the effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria?

To determine the effect of six weeks health education intervention on practice of preventive strategies for dental caries, the two groups' rated responses on items relating to practice of dental caries prevention strategies were computed and compared using mean scores and standard deviation. The benchmark mean was fixed at 2.50 as the midpoint average of the 4 point scale used for the measurement. The summary is presented in Table 2. The rating of the two groups in Table 4.4 revealed a positive response of participants in pre- test of experimental together with pre and post-test of control group on practice of dental caries prevention strategies. The participants in pre-test of experimental group have negative practice of dental caries prevention strategies with a mean and standard deviation of 2.22 and 0.811 respectively, while participants in post-test of same group had improved on practice of dental caries prevention

strategies with a mean and standard deviation of 3.09 and 0.684 respectively. The participants in control group showed an aggregate mean of 2.37 and 2.01 with standard deviation of 0.287 and 0.477 respectively.

All questions has a mean higher than 2.50 making them all agreed in post intervention for experimental; I use to consistently brush my teeth at least twice a day as part of my routine (3.13), I use to regularly use dental floss to clean between my teeth (2.93), I use to incorporate fluoride-based oral care products (toothpaste, mouthwash) (3.57), I use to attend regular dental check-ups and cleanings as recommended (3.33), I use to actively follow a low-sugar diet as a preventive measure against dental caries (2.20), I use to adhere to professional advice, such as dental sealants, to prevent caries (2.77), I use to chewing stick to prevent dental caries (3.07), I use to involve my family and friends in dental care practices to prevent caries (2.97), I use to see the connection between salt and charcoal with caries prevention (3.67) and I use to eat self-cleansing foods like sugarcane to prevent dental caries (3.60) while

lower for all pre-test. The control group had positive knowledge on pre-test; I use to regularly use dental floss to clean between my teeth (2.85), I use to attend regular dental check-ups and cleanings as recommended (2.85), I use to chewing stick to prevent dental caries (2.96), I use to involve my

family and friends in dental care practices to prevent caries (2.97), and I use to eat self-cleansing foods like sugarcane to prevent dental caries (2.96) all others are negative. The positive knowledge were not maintained in post-test.

Table 2: Mean score and Standard deviation on Practice of Dental Caries Prevention Strategies for experimental and control group among Adult.

S/N	Practice of Dental Caries Prevention Strategies among Adult	Status	Experimental		Control	
			Mean	Std. Dev.	Mean	Std. Dev.
1	I use to consistently brush my teeth at least twice a day as part of my routine.	Pre-test	2.44	0.851	2.01	0.590
		Post-test	3.13	0.539	1.68	0.198
2	I use to regularly use dental floss to clean between my teeth.	Pre-test	1.59	0.971	2.85	0.007
		Post-test	2.93	0.574	2.16	0.294
3	I use to incorporate fluoride-based oral care products (toothpaste, mouthwash) into my daily dental hygiene routine.	Pre-test	2.23	0.923	1.12	0.226
		Post-test	3.57	0.479	1.22	0.711
4	I use to attend regular dental check-ups and cleanings as recommended.	Pre-test	2.01	0.992	1.96	0.196
		Post-test	3.33	0.658	2.28	0.255
5	I use to actively follow a low-sugar diet as a preventive measure against dental caries.	Pre-test	1.97	0.944	2.85	0.313
		Post-test	2.20	0.841	1.93	0.782
6	I use to adhere to professional advice, such as dental sealants, to prevent caries.	Pre-test	2.21	1.146	2.15	0.311
		Post-test	2.77	0.940	2.28	0.255
7	I use to chewing stick to prevent dental caries	Pre-test	2.38	0.862	2.96	0.196
		Post-test	3.07	1.048	2.14	0.439
8	I use to involve my family and friends in dental care practices to prevent caries.	Pre-test	2.28	0.749	2.96	0.196
		Post-test	2.97	0.718	2.17	0.458
9	I use to see the connection between salt and charcoal with caries prevention.	Pre-test	2.25	0.833	1.85	0.643
		Post-test	3.67	0.479	1.58	0.915
10	I use to eat self-cleansing foods like sugarcane to prevent dental caries.	Pre-test	2.25	0.833	2.96	0.196
		Post-test	3.60	0.563	2.17	0.402
	Aggregate	Pre-test	2.22	0.811	2.37	0.287
		Post-test	3.09	0.684	2.01	0.477

(Decision mean 2.5)

What is the effect of demographic characteristics (age and marital status) on health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis Kaduna State, Nigeria?

To determine the effect of demographic characteristics (age and marital status) on six weeks health education intervention on practice of preventive strategies for dental caries, between control and experimental groups. The two groups' rated responses on items relating to practice of dental caries prevention strategies were computed and compared using mean scores and standard deviation while both differences were computed. The benchmark mean was fixed at 2.50 as the midpoint average of the 4 point scale used for the measurement. The summary is presented in Table 3

The rating in Table 4.8 on the effect of demographic characteristics on practice which is described as all age groups has a mean above 2.50 in both test of experimental group except pretest of 46-above years. In pretest the aggregate mean is 2.88 and 3.40 for posttest. While in control group 46 year and above has the lowest mean in both tests and 32-38 years has the highest mean in pretest and standard deviation is negative. The aggregate mean is 2.29 and 2.11 in pre and posttest.

In marital status the rating indicated experimental group as having 2.93 and 3.73 as mean, 0.737 and 0.492 as standard deviation. All variable options has a mean above the benchmark of 2.50 for pre and posttest. While in control group pretest of single, and posttest score of widow are less than 2.50. Other mean score in both test are above the benchmark.

Table 3 Mean and Standard deviation between experimental and control group on effect of demographic characteristics (Age and Marital Status) on Practice on Dental Caries Prevention Strategies among Adult.

S/N	Demographic Characteristics	Variable Options	Status	Experimental Mean	Std. Dev.	Control Mean	Std. Dev.	Mean Diff
1	Age	18 – 24 Yrs.	Pre-test	3.19	0.734	2.78	0.810	0.41
			Post-test	3.45	0.985	2.41	1.150	1.04
		25 – 31 Yrs.	Pre-test	3.34	0.714	3.00	0.634	0.34
			Post-test	3.73	0.521	1.76	1.004	1.97
		32 – 38 Yrs.	Pre-test	2.98	0.957	3.10	0.682	-0.12
			Post-test	3.13	0.860	2.12	0.494	1.01
		39 – 45 Yrs.	Pre-test	2.56	0.738	2.56	0.738	0.00
			Post-test	3.33	0.758	2.38	0.862	0.95
		46 – above	Pre-test	2.35	0.766	1.00	0.400	2.35
			Post-test	3.37	0.941	1.11	0.478	1.24
		Aggregate	Pre-test	2.88	0.812	2.29	0.298	0.59
			Post-test	3.40	0.278	2.11	0.987	1.29
2	Marital Status	Married	Pre-test	2.83	0.820	3.19	0.734	-0.36
			Post-test	3.52	0.738	2.76	0.802	2.76
		Divorced	Pre-test	3.00	0.634	2.98	0.957	0.02
			Post-test	3.85	0.613	2.97	0.928	0.88
		Widow	Pre-test	2.78	0.810	2.56	0.738	0.22
			Post-test	3.65	0.326	2.21	1.146	1.44
		Single	Pre-test	3.10	0.682	2.39	0.346	0.71
			Post-test	3.88	0.292	3.50	0.731	0.38
		Aggregate	Pre-test	2.93	0.737	2.78	0.694	0.15
			Post-test	3.73	0.492	2.86	0.902	0.87

(Decision mean 2.5)

Test of Hypothesis

The hypotheses formulated to give statistical validation to the solution proffered for the research questions in establishing effect of health education intervention for the preventing of dental caries among adults are tested here at the fixed probability level of 0.05. The hypotheses were tested with one sample t-test and Analysis of Variance (ANOVA), procedure to determine the difference between pre-test and post-test scores of the two groups after the intervention. The hypotheses were tested as follows:

Hypothesis I: The effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria is not significant.

This hypothesis was tested with the scores of the experimental and control group at both pre-test and post-test stages of the experiment. The one sample t-test procedure was used for the test because of the need to determine the effect of intervention on the

outcome of the experiment. The result of the one sample t-test is summarized in the table 4

The test revealed that the observed mean score of 3.09 for practice of dental caries prevention strategies by adults' post-test was significantly higher than 2.50 used as the test mean. The observed t-value for the test (5.115) obtained at 29 degree of freedom (df) is higher than the critical value indicated at the bottom of the table. The p-value for the test was 0.000 ($p < 0.05$). These observations provided sufficient evidence for rejecting the null hypothesis. The null hypothesis that effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria is not significant is therefore rejected. The result show that the adult have significant practice of dental caries prevention strategies in the study area before and after intervention.

Hypothesis II: There is no significant effect of demographic characteristics (age, gender and marital status) on health education intervention

programme on practice of dental caries prevention strategies among adult of in Zaria metropolis Kaduna State, Nigeria.

This hypothesis was tested with the scores of the experimental and control scores at the pre-test and

post-test stages of the experiment. Analysis of Variance (ANOVA) procedure was used for the test because of the need to determine the effect of pre-test on the outcome of the experiment. The result of the ANOVA is summarized in the table 5

Table 4: One sample t-test on practice of dental caries prevention strategies among adults in Zaria-Metropolis

Variable	Test	N	Mean	Std. Dev.	Std. Error	t-value	df	p-value
Practice of dental caries prevention	Post-test	30	3.09	0.684	0.0223	5.115	29	0.000
Test Mean		30	2.50	0.000	0.000			

(T-critical = 1.98, $p < 0.05$)

Table 5: Analysis of Variance (ANOVA) on effect of socio-demographic characteristics (Age and Marital Status) on practice of dental caries prevention strategies among adults in Zaria-Metropolis

Variable	Source of Variations	Sum of Squares	Df	Mean Square	F	P
Age	Between group	5.506	3	1.825	6.834	0.000
	Within group	102.443	27	0.254		
	Total	107.949	30			
Marital Status	Between group	4.559	3	1.520	6.221	0.000
	Within group	101.881	27	0.261		
	Total	106.440	30			

(Critical value for $F=2.60$, $p < 0.05$)

The result of the test revealed that the adults in Kaduna metropolis differ significantly by their age and marital status on practice of dental caries prevention strategies. For the age, the observed F – value obtained at 3, 27 degree of freedom was 6.834 and p-value observed in the test was 0.000 ($p < 0.05$). In the case of marital status, the observed F – value obtained at 3, 27 degree of freedom was 6.221 and p-value observed in the test was 0.000 ($p < 0.05$). These observations provided enough evidence for rejecting the null hypothesis. In other words, the adults' age and marital status has a significant effect on practice of dental caries prevention strategies in the study area. The null hypothesis that there is no significant effect of demographic characteristics (age and marital status) on health education intervention programme on practice of dental caries prevention strategies among adult of Zaria metropolis Kaduna State, Nigeria is therefore rejected. The Mean differences on demographic characteristics (Age and

Marital Status) on Practice of Dental Caries Prevention Strategies were presented in Table 5

Summary of Tested Hypothesis

The major observations from the effect of health education intervention programme on knowledge, attitude and practice of dental caries prevention strategies among adults in Zaria Metropolis Kaduna State Nigeria are summarized before:

1. The effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria posttest is significant ($p = 0.000$).
2. The effect between demographic characteristics (age and marital status) and health education intervention programme on practice of dental caries prevention strategies among adult of in Zaria metropolis Kaduna State, Nigeria ($p = 0.000$).

DISCUSSION

This study examined the effect of health education intervention programme on practice of dental caries prevention strategies among adults in Zaria Metropolis, Kaduna State, Nigeria. The findings of the study revealed that health education intervention programme significantly improved the practice of preventive strategies against dental caries among the participants in the experimental group. The discussion was based on the hypotheses tested and the observed differences between pre-test and post-test scores of both the experimental and control groups.

The findings from Hypothesis One revealed that the health education intervention programme significantly improved the practice of dental caries prevention strategies among adults in the study area. Before the intervention, participants in the experimental group recorded an aggregate pre-test mean score of 2.22 with a standard deviation of 0.811, which was below the benchmark mean of 2.50. This indicated that the participants initially demonstrated poor preventive oral health practices. Following the six weeks intervention programme, the aggregate post-test mean score increased to 3.09 with standard deviation of 0.684, indicating substantial improvement in the practice of dental caries preventive strategies after the intervention.

The improvement observed in the experimental group may be attributed to increased awareness and understanding of oral health practices acquired during the intervention sessions. The educational programme exposed participants to practical oral hygiene measures such as regular tooth brushing, flossing, use of fluoride products, routine dental visits, and dietary control measures for prevention of dental caries. This finding supports the assertion of Radwan et al.² that adequate oral health education improves individuals' knowledge and utilization of preventive oral healthcare practices. Similarly, the findings agree with Kawashita et al.³ who stated that preventive oral health behaviours play significant roles in reducing the occurrence and progression of dental caries.

The findings also demonstrated improvement in several specific preventive practices after the intervention. Participants in the experimental group showed positive post-test responses in brushing teeth at least twice daily (3.13), regular use of dental floss (2.93), use of fluoride-based oral care products (3.57), attendance at regular dental check-ups (3.33), adherence to professional advice such as dental

sealants (2.77), use of chewing stick to prevent dental caries (3.07), involvement of family and friends in oral health practices (2.97), understanding the relationship between salt and charcoal in caries prevention (3.67), and consumption of self-cleansing foods such as sugarcane (3.60). Most of these preventive practices had lower mean scores during pre-test assessment, indicating that the intervention programme was effective in promoting positive behavioural change among the participants.

However, the practice relating to adherence to low-sugar diet recorded a post-test mean score of 2.20, which remained below the benchmark mean despite slight improvement from the pre-test score of 1.97. This finding suggests that dietary behaviour may be more difficult to modify compared with oral hygiene practices such as brushing and flossing. The difficulty in modifying dietary practices may be associated with cultural feeding patterns, financial constraints, and long-standing habits among adults in the study area. Gupta et al.¹ emphasized that daily sugar intake significantly contributes to the prevalence of dental caries, particularly among individuals with poor oral hygiene practices. Therefore, sustained dietary education and reinforcement may be necessary to achieve long-term behavioural change regarding sugar consumption.

The control group did not demonstrate similar improvement in preventive practices. The control group recorded aggregate mean scores of 2.37 and 2.01 during pre-test and post-test respectively, indicating absence of meaningful improvement after the study period. The decline in post-test mean score among control participants suggests that without structured health education intervention, preventive oral health practices may remain poor or even deteriorate over time. This finding further confirms the effectiveness of the intervention programme in improving oral health practices among adults in Zaria Metropolis.

The one sample t-test further established the significance of the intervention programme. The observed t-value of 5.115 obtained at 29 degree of freedom with p-value of 0.000 showed that the post-test mean score of the experimental group was significantly higher than the benchmark mean of 2.50. This statistical outcome led to the rejection of the null hypothesis, thereby confirming that health education intervention programme had significant effect on practice of dental caries prevention strategies among adults in the study area.

The findings of the present study are in agreement with Sampaio et al.⁴ who observed that oral health interventions and preventive education programmes contribute significantly to reducing the burden of dental caries and improving oral hygiene practices among populations. The findings are also consistent with the report of the World Health Organization⁵ which emphasized that preventive oral health education remains one of the most effective strategies for controlling oral diseases globally.

Similarly, the findings agree with Zahra, Suryanti, and Putri⁶ who reported significant improvement in preventive oral health practices following oral health education intervention among adults. Their study revealed that participants demonstrated improved brushing habits, increased use of fluoride toothpaste, and greater compliance with preventive oral healthcare practices after intervention. Khushbu and Satyam⁷ also reported significant improvement in oral hygiene practices following educational intervention, with participants demonstrating better preventive behaviours after exposure to oral health education sessions.

Despite the positive findings, the present study contrasts with the findings of Ahmed et al.⁸ who reported minimal improvement in oral health preventive practices after educational intervention among adults in low-resource communities. Ahmed et al. attributed the limited improvement to poor access to oral healthcare services, inadequate preventive materials, and low socioeconomic status of participants. The contrast with the present study may be associated with differences in intervention duration, educational methods, and participant involvement during the intervention sessions. The six weeks intervention period utilized in the present study may have provided adequate opportunity for reinforcement and behavioural modification among participants.

Hypothesis Two findings revealed that demographic characteristics, particularly age and marital status, significantly influenced the effect of health education intervention programme on practice of dental caries prevention strategies among adults in Zaria Metropolis. The experimental group recorded aggregate pre-test and post-test mean scores of 2.88 and 3.40 respectively across age categories, indicating improvement in preventive practices after the intervention. Participants aged 25–31 years demonstrated one of the highest improvements with mean scores increasing from 3.34 during pre-test to

3.73 during post-test. Participants aged 18–24 years also improved from 3.19 to 3.45 following the intervention programme.

Participants aged 46 years and above demonstrated remarkable improvement from a pre-test mean score of 2.35 to a post-test mean score of 3.37. This finding indicates that older adults who initially exhibited poor preventive practices were able to improve significantly after exposure to the educational intervention. The improvement among older adults may be linked to increased awareness regarding the consequences of untreated dental caries and greater appreciation of preventive measures after the intervention sessions.

The findings regarding marital status also demonstrated considerable improvement after intervention. The experimental group recorded aggregate mean scores of 2.93 during pre-test and 3.73 during post-test. Single participants demonstrated the highest post-test mean score of 3.88 compared with their pre-test score of 3.10. Divorced participants improved from 3.00 to 3.85, widowed participants improved from 2.78 to 3.65, while married participants improved from 2.83 to 3.52. These findings indicate that the intervention programme positively influenced preventive oral health practices across different marital categories. The Analysis of Variance (ANOVA) further confirmed that demographic characteristics significantly influenced preventive oral health practices among the participants. The calculated F-value for age was 6.834 with p-value of 0.000, while marital status recorded F-value of 6.221 with p-value of 0.000. These findings led to the rejection of the null hypothesis and confirmed that age and marital status significantly influenced participants' preventive oral health practices after intervention.

The findings agree with the study conducted by Pradhan, Pruthi, Sharma, Chavan, and Verma⁹ who reported that demographic variables significantly influence preventive oral health practices following educational intervention. Their study revealed that younger adults and socially supported individuals were more likely to adopt positive oral health behaviours after intervention. The findings also support the observations of Olusile et al.¹⁰ who reported that socio-demographic factors significantly influence oral health practices among Nigerian adults.

However, the findings differ from Musa and Ibrahim¹¹ who reported that demographic characteristics did not significantly influence preventive oral health

behaviours following intervention among rural adults. The disparity may be attributed to differences in study environment, accessibility of oral healthcare services, literacy level, and socioeconomic conditions between rural and urban populations. Unlike the rural setting reported by Musa and Ibrahim, the participants in the present study resided within an urban metropolis where exposure to health information and healthcare facilities may have enhanced the effectiveness of the intervention programme.

Overall, the findings of this study demonstrated that health education intervention programme significantly improved the practice of dental caries prevention strategies among adults in Zaria Metropolis, Kaduna State, Nigeria. The findings further established that demographic characteristics such as age and marital status significantly influenced participants' responses to the intervention programme. The significant improvements observed between pre-test and post-test scores among participants in the experimental group emphasize the importance of structured oral health education programmes in promoting preventive oral health behaviours and reducing the burden of dental caries among adults.

Summary of Findings

The major observations from the effect of health education intervention programme on knowledge, attitude and practice of dental caries prevention strategies among adults in Zaria Metropolis Kaduna State Nigeria are summarized before:

1. The effect of health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria posttest is significant ($t = 5.115$; $p = 0.000$).
2. The effect of demographic characteristics (age and marital status) on health education intervention programme on practice of dental caries prevention strategies among adult of in Zaria metropolis Kaduna State, Nigeria is significant ($t = 6.834$, 6.221 ; $p = 0.000$).

CONCLUSION

From the findings of the examination of the effect of health education intervention programme on knowledge, attitude and practice of dental caries prevention strategies among adults in Zaria Metropolis Kaduna State Nigeria, the researcher wishes to conclude as follows:

1. Health education intervention programme on practice of dental caries prevention strategies among adult in Zaria metropolis of Kaduna State, Nigeria is effective.
2. Demographic characteristics (age and marital status) have effect on health education intervention programme on practice of dental caries prevention strategies among adult of in Zaria metropolis Kaduna State.

Recommendation

The study has the following recommendations:

1. Given the significant improvement, consider scaling the intervention to other metropolitan and rural areas within Kaduna State to enhance dental health practices more broadly. Integrate this effective intervention as part of routine public health education efforts to promote sustained dental caries prevention. Create a system of periodic refresher courses, community engagement workshops, and distribution of educational materials to reinforce the practices over time.
2. Tailor the intervention materials to address the unique needs and learning preferences of different age groups and marital statuses to maximize engagement and effectiveness. Implement segmented health education sessions, with specific programs targeting younger vs. older adults, or married vs. unmarried individuals, based on how they responded to the intervention. Leverage demographic data to strategically plan outreach and promotional efforts, ensuring that materials are relatable and relevant to the target audience.

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APPENDIX: INTERVENTION PACKAGE

SCHEME OF WORK FOR HEALTH EDUCATION INTERVENTION PROGRAMME ON DENTAL CARIES PREVENTION STRATEGIES

Scheme of work for health education intervention programme on dental caries prevention strategies

Week	Topics	Contents	Activities	Resources
One	Overview of Dental caries	1. Meaning of dental caries 2. Causes of dental caries 3. Effect of dental caries 4. Prevalence of dental caries	The researcher present lesson on definition, causes and effect of dental caries. The participants follow using the manuals.	Lesson plan Manual (modules) Presentation
Two	Routing dental checkup	1. Definition of dental checkup 2. Services provided during routine dental checkup 3. Important of routine dental checkup.	The researcher present lesson on definition, services and important dental checkup. The participants follow using the manuals.	Lesson plan Manual (modules) Presentation
Three	Home prophylaxis	1. Meaning of home prophylaxis 2. Varies home preventive measure 3. How to use them effectively	The researcher present lesson on home prophylaxis and using charcoal. The participants follow using the manuals.	Lesson plan Manual (modules) Presentation
Four	Preventive measures for	1. Definition of mechanical methods for caries prevention 2.Types of mechanical methods	The researcher present lesson on tooth brushes, chewing stick and floss dental caries	Lesson plan Manual (modules)

	dental caries I	3. Techniques of toothbrushing and chewing stick 4. Important of mechanical methods	prevention. The participants follow using the manuals.	Presentation
Five	Preventive measures for dental caries II	1. What are chemical prevention measures 2. Identify various chemical methods 3. What are dietary prevention measures 4. Identify varies dietary methods	The researcher present lesson on mouth washes and rinses on dental caries prevention. The participants follow using the manuals.	Lesson plan Manual (modules) Presentation
Six	Self-efficacy in caries prevention	1. Community Oral health education 2. Behavioral practices in prevention techniques 3. Psychological factors in caries prevention	The researcher present lesson on need for community oral health education and psychological factors in dental caries prevention. The participants follow using the manuals.	Lesson plan Manual (modules) Presentation

LESSON PLANS FOR HEALTH EDUCATION INTERVENTION PROGRAMME ON DENTAL CARIES PREVENTION STRATEGIES

Duration of programme: Six weeks

Target population: Adults
(Male and Female)

Number of participants: 30

Duration: 60mins

Time: 9:00am

– 10:00am

Setting: LEA
Bomo

Methodology: Demonstration,

Discussion and Lecture

Resources:

Researcher, Assistants, Modules and Lesson plan

Instructional materials: White Board, Marker, Poster, Pictures, Video, Manuals

LESSON ONE: OVERVIEW OF DENTAL CARIES

Behavioural Objectives

1. Mention causes of dental caries
2. List effect of dental caries

Previous Knowledge

The participants have knowledge of dental caries (tooth decay).

Introduction

The researcher welcome and introduce the research assistants to the participants. He ask questions on aspect of oral hygiene and dental caries. The researcher introduces lesson with the overview of the

previous lesson and give a background to the present's lesson for the week.

Teachers Activity

- The researcher briefly explained the objectives and benefit of the programme to the participants and was told about the need for cooperation with respect to punctuality, attendance and good attitude during the course of the programme which will be accepted by participants.
- The researcher introduced the topic overview of dental caries to the participants by asking then the meaning of dental caries/tooth decay.
- The researcher appreciated the participants and urged them to be punctual for the next session.

Learners Activity

- Participants was shown the diagram of a normal tooth and carious tooth on the diagram while they were rightfully guided by the researcher.
- The participants with the help of the researcher mentioned causes, effect and prevalence of dental caries.
- The participants concentrated during the intervention

Evaluation

The researcher evaluates the lesson. Ask the participants

1. Define dental caries
2. Mention two (3) causes of dental caries

Summary/Conclusion

The researcher goes over the important part of the lesson and identify important points and illustrations from the intervention manual.

Assignment

1. Enumerate two (2) during routine dental checkup.
2. State two (2) importance of routine dental checkup.

LESSON TWO: ROUTING DENTAL CHECKUP

Behavioural Objectives

1. List two (2) services during routine dental checkup
2. Itemize three (3) importance of routine dental checkup

Previous Knowledge

Participants have been taught definition of dental caries, causes and its effect.

Introduction

The researcher introduces lesson with the overview of the previous lesson and give a background to the present's lesson for the week.

Teachers Activity

- The researcher will ask the participants to mention services provided during dental checkups.
- The researcher explain to the participants on the importance of routine dental checkups.
- The researcher appreciated the participants and urged them to be punctual for the next session.

Learners Activity

- The participants, through the use of questions and answer methods of teaching, would explain dental checkups and will be guided by the researcher.
- The participants listens using the manuals.

Evaluation

The researcher evaluates the lesson. Ask the participants

1. List two (2) during routine dental checkup
2. Itemize three (2) importance of routine dental checkup

Summary/Conclusion

The researcher goes over the important part of the lesson and identify important points and illustrations from the intervention manual.

Assignment

1. Itemize three (3) methods use at home
2. Explain the techniques of using charcoal

LESSON THREE: HOME PROPHYLAXIS

Behavioural objectives

1. Explain three home measures
2. How to use activated charcoal and salt

Previous Knowledge

Participants have been taught routine dental checkups, its purpose and importance.

Introduction

The researcher introduces lesson with the overview of the previous lesson and give a background to the present's lesson for the week.

Teachers Activity

- The previous lesson was reviewed. Assignment was requested and the building background for the new lesson will be done by the researcher.
- The researcher will guide the participants on home prophylaxis for dental caries.
- The researcher explain to the participants on various home remedies such as neem and clove use.
- The researcher appreciated the participants and urged them to be punctual for the next session.

Learners Activity

- The participants listens using the manuals.
- The participants was guided on how to prevent dental caries using charcoal and salt for cleaning the teeth.

Evaluation

The researcher evaluates the lesson. Ask the participants

1. Define home remedies
2. Outline three (3) home measures

Summary/Conclusion

The researcher goes over the important part of the lesson and identify important points and illustrations from the intervention manual.

Assignment

1. Explain the techniques of toothbrushing and
2. List two (2) importance of mechanical methods

LESSON FOUR: PREVENTION OF DENTAL CARIES I

Behavioural Objectives

1. List four (4) mechanical methods of prevention
2. List three (3) importance of mechanical methods

Previous Knowledge

Participants have been taught local techniques to prevent dental caries

Introduction

The researcher introduces lesson with the overview of the previous lesson and give a background to the present's lesson for the week.

Teachers Activity

- The previous lesson was reviewed. Assignment was requested and participants were guided.
- The researcher explain to the participant the various mechanical strategies such as tooth brushes.
- A video demonstrating the technique of tooth brushes will be displaced during the session by the researcher.
- The researcher explain to the participants on the importance of using chewing stick and tooth brushing.

Learners Activity

- The participants listens using the manuals.
- Teeth model will be given to participants to replicate the various brushing techniques demonstrated.
- The participants were guided on the mechanical strategies for dental caries prevention.

Evaluation

The researcher evaluates the lesson. Ask the participants

1. Itemize the techniques of toothbrushing and chewing sticking
2. List three (3) importance of mechanical methods

Summary/Conclusion

The researcher goes over the important part of the lesson and identify important points and illustrations from the intervention manual.

Assignment

1. Explain the dietary preventive measures.
2. List one (1) chemical measure.

LESSON FIVE: PREVENTION OF DENTAL CARIES II

Behavioural Objectives

1. List two (2) chemical methods
2. Understand the dietary preventive measures

Previous Knowledge

Participants have been taught mechanical methods such as using tooth brushes and chewing stick in dental caries prevention.

Introduction

The researcher introduces lesson with the overview of the previous lesson and give a background to the present's lesson for the week.

Teachers Activity

- The previous lesson was reviewed. Assignment was requested and participants were guided.
- The researcher explain to the participant the varies chemical strategies such as using mouth washes, rinses, warm water & salt and dentifrices.
- The researcher demonstrate to the participants how mouth washes are used at night and before and morning.
- The researcher explain to the participants on the importance of using diet and self-cleansing foods.

Learners Activity

- The participants listens using the manuals.
- The participants were guided on the chemical strategies for dental caries prevention.

Evaluation

The researcher evaluates the lesson. Ask the participants

1. List two (2) chemical methods
2. Itemize two (2) the dietary preventive measures

Summary/Conclusion

The researcher goes over the important part of the lesson and identify important points and illustrations from the intervention manual.

Assignment

1. What is community oral health education?
2. State two (2) behavioural practices to increase self-efficacy
3. State two (2) psychological factors to consider for caries prevention

LESSON SIX: SELF-EFFICACY IN DENTAL CARIES PREVENTION

Behavioural Objectives

1. Identify the behavioural practices to increase self-efficacy
2. Itemize three (3) psychological factors to consider for caries prevention

Previous Knowledge

Participants have been taught chemical methods such as using mouth washes and tooth paste in dental caries prevention.

Introduction

The researcher introduces lesson with the overview of the previous lesson and give a background to the present's lesson for the week.

Teachers Activity

- The previous lesson will be review and entry behaviour for the new lesson will be discussed.

- The researcher discuss on the need and importance of community oral health education in dental caries prevention.
- The researcher guide the participant to understand the psychological factors in dental caries prevention.

Learners Activity

- The participants listens using the manuals.
- The participants were guided to identify negative and positive behaviours in self-efficacy.
- Question, comments and observations were asked by the participants.

Evaluation

The researcher evaluates the lesson. Ask the participants

1. Identify the behavioural practices to increase self-efficacy
2. Itemize three (3) psychological factors to consider for caries prevention

Summary/Conclusion

The researcher goes over the important part of the lesson and identify important points and illustrations from the intervention manual.

Assignment

1. Write on the various techniques of tooth brushing
2. Identify the importance of dental caries prevention