

# Effect of Health Education Intervention on Diabetes Mellitus Prevention Practices among Community Dwelling Adults in Anambra Central Senatorial District, Anambra State

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## Abstract

Diabetes mellitus is a chronic metabolic and disabling medical condition that has challenged the health of all ages and cultures in recent time. We assessed the effect of health education intervention (HEI) on diabetes prevention practices among community dwelling adults (CDAs) in Anambra Central Senatorial District, Anambra State. In a quasi-experiment adopting pre-test post-test non-control group design, a total number of 276 (64 male and 212 female) adults participated. Data collection was done using self-structured Diabetes Prevention Practices Questionnaire (DPPQ). Mean, standard deviation and analysis of covariance were used for analyses. The findings reveal that the CDAs who were given HEI adopt higher prevention practices on diabetes than their counterpart, and there was no significant interaction effect of HEI and age, gender and level of education on the mean diabetes prevention practices scores of CDAs after HEI. This research proves that health education intervention showed that health education is implicated in adoption of the prevention practices of diabetes. However, health educators should ensure that adequate information of diabetes prevention practices are imparted on community dwelling adults using suitable channels and medium.

**Keywords:** Health education intervention, Diabetes mellitus, Community dwelling adults, Prevention, Practice, Effect

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## 1. INTRODUCTION

Diabetes mellitus is a chronic metabolic and disabling medical condition that has challenged the health of all ages and cultures in recent time. The Prevalence of diabetes mellitus is projected by [1] to rise to 552 million worldwide by the year 2030, representing more than 54 per cent increase in less than 20 years. [2] estimated that 425 million people have diabetes worldwide. [2] pointed out that Type I diabetes mellitus (previously known as juvenile or childhood onset diabetes) makes up about 10 per cent of this population, with type2 diabetes (T2D) making up about 90 per cent of the cases, and nearly 50 per cent of these are undiagnosed.

The increased cases of diabetes have resulted in millions of deaths, as over 1.6 million deaths were directly caused by T2D in 2016. This made it the eighth leading cause of death worldwide [1]. In this report, [1] indicate that diabetes has tripled in the last two decades globally, with the highest prevalence rates found in developing countries.

Sub-Saharan African countries seem to be severely hit by diabetes. [3] observed that the burden of diabetes in Africa is rising at a faster rate compared to other parts of the world. [1] reported that diabetes prevalence is highest in African region among adults aged 45 years and above. [4] posited that of the approximately 650 million people in sub-Saharan Africa; 10-20 million may be diabetic. Nigeria is the most populous country in Africa with an estimated population of 191 million (51% male, 49% female) people, having an estimated growth rate of 2.43 per cent per annum and a high dependency ratio of 88 per cent [5]. Due to this vast population, Nigeria immensely contributes to the total burden of diabetes in the continent [6].

In Nigeria, diabetes is associated with high morbidity and mortality, with more than five million Nigerians affected [7]. Although T2D in the adult population in Nigeria is increasing, the prevalence rate varies yearly and regionally [4]. For instance, a systematic review and meta-analysis conducted by [6] showed an estimated overall diabetes prevalence of 25.7 per cent while [4], reported that diabetes mellitus prevalence ranged from 2.1 per cent to 43.5 per cent in adult population. The prevalence of diabetes has also been shown to be on the increase in South East Nigeria with pooled prevalence rate at 4.6 per cent [8]. Comparably, high cases of diabetes have also been reported in Anambra State at 3.8 per cent [9]. An individual therefore requires a health education intervention to engage in healthy behaviours practices that can reduce the risk of developing diabetes.

Evidence from literature has shown that health education interventions create change by influencing individual attitudes, beliefs, skills and practice. Health education interventions (HEI) also increase social support, and create supportive environments for health promotion [10]. Diabetes education programme according to [11], may consist of information about diabetes, education and communication related to healthy lifestyle, proper nutrition, physical activity, and importance of regular medical checkups. It should also contain explanations on meaning of diabetes, its risk factors, prevention, control, treatment options, as well as prognosis. We purport that the prevention practices of diabetes among community dwelling adults (CDAs) will be positively improved by HEI.

[7]; [8] emphasize that health education is the most important part of diabetes prevention and care. Adequate education on diabetes mellitus and its adequate management has been revealed to lower glycosylated hemoglobin levels, and improve blood sugar levels. Many Nigerians do not have access to education and services required to treat and prevent diabetes [8]. Hence, irreparable damages from complications of T2D can be prevented and brought to the lowest minimum through HEI.

Health education intervention is activities aimed are to promote disease preventing behaviours that optimize good health. [12] asserted that an intervention as a planned and systematically implemented activity taking place in a social structure which aims at changing practices, attitude, or behaviours of a person or population. [12] added that usually, an intervention is part of a study and subject to evaluation and assessment. [13] argued that an intervention is a combination of programme elements or strategies designed to produce behaviour changes or improve health statuses among individuals or an entire population, and may include educational programmes.

[14] emphasized that when individuals are educated on their blood glucose level, they take more responsibility and acquire disease specific prevention practices and skills. According to [10], these activities are designed using interventions that support lifestyle changes especially among adults.

Middle and older adults are still at the highest risk for developing T2D [15]. This may be attributed in part to poor lifestyle habits and health conditions, such as vascular diseases, obesity and high blood pressure, but unhealthy lifestyle is the broader issue in many cases. Similarly, [16] reports that rates of T2D remains high in the adult population, impacting about 25.2 per cent of those over 45 years of age.

Some adults still have limited education on the prevention practices, and only hear about the disease when they have been diagnosed with T2D or have already become irreversibly sick and presenting complications.

Unfortunately, researchers and educators have not given much desired attention to the HEI. Evidently, limited research has been conducted on the HEI on diabetes prevention practices. This study addresses this gap in the literature. In view of these facts, the study investigated the effects of health education intervention on diabetes prevention practices among community dwelling adults. Specifically, the study determined: mean diabetes prevention practices scores of CDAs before and after HEI; mean diabetes prevention practices scores of CDAs before and after HEI based on their ages; mean diabetes prevention practices scores of male and female CDAs before and after HEI; mean diabetes prevention practices scores of the education level of CDAs before and after HEI based on their education level. it was hypothesized that there is a significant interaction effect of age, gender, and education level on the mean diabetes prevention practices scores of community dwelling adults.

The study findings would help to inform a more effective response from health education programme planners and policy makers in designing health programmes that are culturally appropriate and relevant, and in sensitizing and guiding both diagnosed and undiagnosed adults on diabetes and its complications before diagnosis of the disorder. Also, the findings would inspire both State and Federal authorities to make a commitment to improving Non-communicable diseases (NCD) and diabetes care in Nigeria.

## **Material and methods**

### **Study design and setting**

The design of the study was quasi-experimental. Specifically, the study adopted pretest posttest non-equivalent comparison (control) group design. The study was conducted in Anambra Central Senatorial District, among community dwelling adults. Anambra Central Senatorial District is one of the three Senatorial districts in Anambra State, South-East, Nigeria, which is comprised of seven Local Government Areas which make up Anambra Central Senatorial district with 58 communities. The area was chosen for the study due to its peculiar mixed culture which in many ways has profound influence on adult's health.

### **Participants**

The study participants consisted of all the 868, 792 community dwelling adults in the study area. Out of this population, 412, 527 were males while 456, 265 were females. Adults aged 40 years and above were considered appropriate since literature reports that adults of this age and older, are more susceptible to developing T2D [16].

### **Sampling procedures**

A sample size of 276 community dwelling adults, consisting of 212 females and 64 males was used for the study.

From the seven local government areas (LGAs) that make up Anambra central senatorial district, the researchers selected four LGAs by random technique of balloting without replacement. From each of the four LGAs drawn, simple random technique of balloting without replacement was used to select four communities that were used for the study. From each of the four communities, adults were allowed to voluntarily opt for health education. Names of adults who indicated interest were taken, and they joined the health education class serving as the experimental group. However, 276 adults participated in the study.

### **Material and measures**

The instrument used for data collection comprised a self-structured Diabetes Prevention Practices Questionnaire (DPPQ). The instrument was developed by the first and second authors; and was made up of 20 multiple choice questions. The DPPQ was validated by three experts, Two experts came from the Department of Human Kinetics and Health Education, and one came from measurement and evaluation in the Department of Educational Foundations, Nnamdi Azikiwe University Awka. The DPPQ yielded a reliability coefficient of 0.83 using split-half method (Spearman Brown Coefficient).

### **Data collection procedure**

The current research was developed in accordance with the Ethical Principles of the World Medical Association Declaration of Helsinki for medical research involving human subjects [17], and the research was approved by Research Ethics Committee of the Faculty of Education, Nnamdi Azikiwe University, Awka, Nigeria.

In order to gain access to the respondents, a letter of introduction was obtained from the Head, Department of Human Kinetics and Health Education, Nnamdi Azikiwe University Awka. This was to enable the researchers obtain ethical clearance that was presented to the Presidents of Town Unions of the sampled Communities. The researchers requested the community leaders in the selected communities to inform the people about the study, rationale for the study and need for their involvement in the study. However, the researchers emphasized voluntary participation of the community dwelling adults by signing a consent form. Subsequently, a specified date and time based on mutual consent was agreed upon.

Prior to treatment, pretest scores were collected from the subjects in the selected communities using the DPPQ. After treatment, which lasted for six weeks, the items of the DPPQ were re-arranged randomly and re-administered to all the participants to collect the post-test scores.

### **Data analysis**

The IBM Statistical Package for Social Sciences (SPSS) version 23.0 was used for all the statistical analyses. Mean, standard deviation and analysis of covariance were used for analyses. The normality of the data was checked through skewness, kurtosis and the Kolmogorov–Smirnov (K-S) test. Normal distribution was considered if the skewness showed values between -2 and +2, and the KS test is not significant [18]. In order to adjust the sample to normal, the data of each variable were adjusted using  $\ln(x)$  and  $x^2$  algorithms if they were not normally distributed. The internal consistency of the DPPQ was estimated using split-half method (Spearman Brown Coefficient). All the tests were 2-tailed, and the probability values less than 0.05 ( $p < 0.05$ ) were considered significant.

### **Results**

Table 1 demonstrates that the pretest mean and standard deviation scores of diabetes prevention practices score of community dwelling adults in Anambra Central Senatorial District were 7.20 and 2.28 while their posttest mean and standard deviation score were 9.93 and 3.60. The gained mean score was 2.73.

Table 2 reveal that community dwelling adults in Anambra Central Senatorial District below 50 years had prevention practices mean scores of 7.20, 9.50 and 2.30 as pretest, posttest and mean gain scores respectively while those from 50 years and above had 7.20, 10.39 and 3.19 as pretest, post-test and mean gain scores respectively. This indicates that CDAs aged 50 + years had higher mean gain score than those aged below 50 years.

Table 3 reveal that the mean diabetes prevention practices scores of male community dwelling adults in Anambra Central Senatorial District to be 7.56, 8.72 and 1.16 as pretest, posttest and mean gain scores respectively while their female counterpart had 7.09, 10.30 and 3.21 as pretest, post-test and mean gain score. This indicates that female CDAs had higher mean gain score than male CDAs.

Table 4 demonstrates the mean diabetes prevention practices scores of community dwelling adults in Anambra Central Senatorial District with low education level to be 7.06, 10.02 and 3.14 as pretest, posttest and mean gain score respectively while those with higher education level had 7.46, 9.78 and 2.32 as pretest, post-test and mean gain score respectively. This indicates that CDAs with low education level had higher mean gain score than those with higher education level.

Table 5 shows that there was a significant interaction among age, gender and educational status on the mean

diabetes prevention practices scores of community dwelling adults in Anambra Central Senatorial District before and after health education intervention.,  $F(1,267)= 7.137, p<0.05$ . The null hypothesis was therefore rejected. This interaction was depicted better in the figures 1 and 2.

## Discussion

The findings of this study reveal to a large extent a positive effect of HEI on diabetes prevention practices of the participants. The improved prevention practices mean score after HEI was not surprising and can be linked to improvement in understanding and awareness. There are overwhelming evidences in the literature that back the efficiency of structured HEI. [19] reported that, effective health education focus on helping adults achieve glycemic control and stick to lifestyle changes through diet and exercise. The finding was consistent with the findings of [20] who reported that there were improved prevention practices after HEI. This finding contradicts the finding of [21] who reported poor prevention practices related to diabetes mellitus. The similarities in the finding could be because of the adoption of similar research designs by the researchers. However, the disparity in the finding of the study maybe due to variations in geographical context. For instance, while [21] conducted their study in Nepal, the researchers of this study conducted it in Anambra State, Nigeria. The tenets of the reviewed information motivation behavioural skill (IMB) model was applied in this finding to show that CDAs after HEI became well informed, and highly motivated (personally and socially) to take health-related actions, such as diabetes preventive behaviours. There was a significant difference in the mean diabetes prevention practices scores of CDAs after HEI.

The finding shows that CDAs who are 50 years and above had better diabetes prevention practices scores after HEI. It is expected that after exposure to educational intervention, such HEI, there should be an improvement in diabetes prevention practices of CDAs. The finding was consistent with the findings of [22] who reported improved self-care behaviour and prevention practices among adult aged 50 years and above. The finding contradicts the finding of [23] who reported that considerable proportion of adults in Lebanon below 50 years had better knowledge of prevention practices of diabetes. The reason for the finding might be that the older adults have other chronic morbidities that have opened their eyes to severity of diseases. Hence, the improved practices. The study also revealed that there was a significant difference in the mean diabetes prevention practices scores of CDAs after HEI based on their ages. The tenets of the reviewed Health Belief Model (HBM) was applied in this finding to show that behaviour of the CDAs can be influenced by their perceptions on their health and the desire to improve through lifestyle interventions, such as diet and exercise which could lead to the desired outcome of better health and prevention of diabetes mellitus complications.

The finding also shows that the diabetes prevention practices mean scores of female CDAs increased after HEI. The finding was expected and not surprising. This is because; females naturally are more poised for attitudinal change in health-related issues. This could also be the reason why the standard deviation of the females showed better closeness of responses. Also, females are known to be more concerned with their health than men and so, could be more responsive than men to HEI designed to improve their diabetes prevention practices. The finding was consistent with the findings of [24] who reported that higher knowledge scores were found among females regarding diabetes prevention practices. Another reason for the finding could be that females were more affected by diabetes than males. For instance, [25] posited that females were more predisposed to obesity, a risk factor for diabetes. Hence, the eagerness for behaviour change. However, [26] reported that females lacked knowledge of diabetes and its prevention, and self-care-related practices. The tenets of the IMB skill model were applied in this study to explain that information, motivation and behavioural skills are fundamental determinants of a preventive behaviour.

The analysis of covariance affirmed that there was a significant difference in the mean diabetes prevention practices scores between male and females. This finding is not surprising because females are more cautious in their healthy lifestyle practices than males while males engaged more in unhealthy lifestyle practices. Evidences suggest that significant gender differences exist in some aspects of therapy, coping behaviour and help seeking [27]. Similarly, many studies conducted in diverse population have shown that girl and women performed better than boys and men regarding diabetes prevention practices. However, this contradicts the findings of [28] who reported no significant differences between male and females regarding their basic knowledge and preventive practices.

The study reveals that the mean diabetes prevention practices scores of CDAs with low education level increased after HEI. The finding was expected and not surprising. It is expected that after exposure to educational intervention, there will be an increase in knowledge on the targeted concept which includes the preventive practices for diabetes. The finding was consistent with the findings of [10] and [29] who reported a significant difference in the pre and post test scores of adults after HEI. Also, [26] reported that adults with high level education had good knowledge of diabetes but it did not translate into good practices as majority of the subjects did not involve in any preventive measure. Therefore, structured HEI improves knowledge. However, the finding contradicts the findings of [30] who reported that adults with higher level education had more

diabetes prevention practices scores. These differences might be as a result of information outside the intervention setting, such as alternative sources of information from social structures like the August meeting for the females, jingles and health mobilizations brought to the market places. On another note, the intervention might also be a motivating factor for some of the CDAs who desire to be in an educational setting.

There was no significant difference between the mean diabetes prevention practices scores of CDAs after HEI based on their education level. The finding was surprising because level of education is positively associated with disease knowledge and prevention. Also, adults with higher level of education were expected to have more access to the internet, mass media and the likes than adults with low level of education. This finding is at variance with that of [10].

There is an evidence of significant interaction effect of age, gender and level of education on the diabetes prevention practices of CDAs. This shows that when the three factors are combined, their interaction have a significant effect on the dependent variable. This is also similar to the work of [31] and [30] who recorded a significant interaction effect of age, gender and level of education on diabetes related prevention practices. The finding was expected and not surprising. This is because studies by [32] and [24] indicate that female CDAs had better diabetes prevention practices. Similarly, [22] reported that adults above 50 years had better diabetes prevention practices than their counterparts below 50 years. Also, [33] and [29] reported that adults of low level education had better post test scores after HEI. The finding however contradicts the findings of [34] who reported no significant interaction after HEI. The similarities in the findings could be because it comprised of adults within the same age bracket. The disparity in the finding could be attributed to variations in geographical contexts by the studies. It is therefore plausible to attribute similarities in findings to the subjects' characteristics. The tenets of the reviewed HBM were able to target knowledge gaps and cultures that negatively influenced the subjects' behaviours negatively.

### **Implications of Findings of the Study to Public Health Education**

The findings from the difference in the diabetes mellitus prevention practices mean scores of CDAs increased after HEI. The educational implication of this finding is that structured HEI helped improve the prevention practices on diabetes mellitus in adults, a necessary skill that enabled them to understand the concept, the types of diabetes, risk factors and complications associated with it. Also, HEI demonstrated impact on improving knowledge of prevention practices, changing attitude and social norms, as well as building self-efficacy which in turn, improved their health behaviour. In addition, the behavioural implication of the finding cannot be overlooked. Community dwelling adults have gradually turned to western diet and way of life due to ignorance on the negative health implications. A community based HEI would help improve their prevention practices and avoidance strategies.

Findings on interaction effect of HEI and age, gender and level of education on the diabetes prevention practices scores of CDAs have a positive implication on their health and in their culture. Culturally, HEI empowers adults to question their social context and challenge negative social norms, including gender norms, and to be part of broader societal efforts towards gender equality. The finding would help in policy making. It would make relevant stakeholders, health institutions, Non-Governmental Organisations (NGOs) working with adults in the area of diabetes education to be aware of, and sensitive to HEI strategies for positive outcomes. Hence, delivering the contents of the intervention effectively and efficiently.

### **Conclusions**

Our findings have shown that HEI is effective in adoption of CDA's diabetes mellitus prevention practices. The diabetes prevention practices mean scores of CDAs after HEI increased. There was a significant difference in the diabetes mean prevention practices scores of CDA's after HEI. In addition, there was a significant interaction effect of HEI and age, gender and level of education on the mean diabetes prevention practices scores of CDAs after HEI. However, Health education programme planners and policy makers should develop structured diabetes mellitus education lesson plan to improve health education that is tailored to Igbo culture. Federal and State ministries of health should support health education and promotion Department for integration of structured diabetes mellitus education into the curriculum with well trained staff and time, allocated for the implementation of such interventions. Health care practitioners and community health extension workers who serve as first point of contact in the communities should recommend blood sugar testing to their clients during consultations to prevent complications from diabetes mellitus. Health educators should ensure that adequate information and knowledge of diabetes and prevention practices considering socio-demographic characteristics of age, gender, education level among others are imparted on community dwelling adults using suitable channels and medium. The cost glucometer and test strips should be subsidized by the government and policy makers to enhance affordability for CDAs.

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### Conflict of Interest

The authors have declared no competing or conflict interests.

### Authors' Contribution

Conception and study design: NEA, JOO and TEI. Data collection: NEA, TEI, VAI, AI and SCE. Statistical Analysis and interpretation: NEA, JOO and TEI. Manuscript Preparation: NEA, JOO and TEI. Literature Search: NEA, TEI, VAI, AI and SCE. All authors have read and given final approval of the version to be published; and agreed to be responsible for all aspects of the work in ensuring that questions related to the accuracy and integrity of any section of the work are appropriately investigated and resolved.

### References

1. World Health Organization. Diagnosis of diabetes. *Diabetes Care*. 2016; 8(Suppl.1):S8–S16. doi: 10.2337/dc15-S005
2. International Diabetes Federation. International Diabetes Federation: Diabetes atlas. 2017. [Available at <http://www.idf.org/diabetesatlas> [Accessed on 10 April 2021]]
3. Mercer T, Chang AC, Fischer L, Gardener A, Kerubo I, Tran DN, Laktabai J, Pastakia S. Mitigating the burden of diabetes in Sub-Saharan Africa through an integrated diagonal health systems approach. *Diabetes Metabolic Syndrome Obesity*. 2019; 12:2261-2272. doi: 10.2147/DMSO.S2072
4. Uloko AE, Musa BM, Ramalan MA, Gezawa ID, Puepet FH, Uloko AT, Borodo MM, Sada KB. Prevalence and Risk factors for Diabetes mellitus in Nigeria: A systematic review and Meta-analysis. *Diabetes Therapy: Research, Treatment and Education of Diabetes and Related Disorders*. 2018; 9(3):1307-1316.
5. National Bureau of Statistics. Nigerian annual abstract of health and human services. 2016. [Available at <http://nigerianstat.gov.ng>] [Accessed on 16 August 2021]
6. Adeloye D, Ige JO, Aderemi AV, Adeleye N, Amoo EO, Auta A, Oni G. Estimating the prevalence, hospitalization and mortality from type 2 diabetes mellitus in Nigeria: a meta-analysis. *British Medical Journal*. 2017; 11(5): 7.
7. Diabetes Association of Nigeria. Clinical practice guidelines for diabetes management in Nigeria (2nd Ed.). Diabetes Association of Nigeria; 2014.
8. Chinenye, S. Diabetes and related diseases in Nigeria: Need for improved primary care in rural communities. *Research Journal of Health Sciences*. 2019; 2:2.
9. Onyekwelu J. Relationship of combined frequency of hypertension and diabetes mellitus to socio-economic status: A comparative study in Anambra State of Nigeria. *Journal of Public Health*. 2019; 11(4):90-96.
10. Bett SJ. Effectiveness of educational intervention in Kenya on diabetic knowledge & HbA1c levels on Keyan Adults with T2DM. Unpublished PhD Dissertation, College of Health and Human Services, Andrews University, Michigan; 2019.
11. World Health Organisation. WHO multi-country study on diabetes: initial results on prevalence and health outcomes. GENEVA: WHO Publication; 2017.
12. Green LW, Kreuter MW. Health programme planning: An educational and Ecological Approach (4<sup>th</sup> Ed.). Boston: Mc Graw-Hill; 2005.
13. Plotnikoff RC, Costigan SA, Karunamuni ND, Lubans DR. Community-based physical activity interventions for treatment of type2 diabetes: a systematic review with meta-analysis. *Frontiers in Endocrinology*. 2013; 4:3.
14. Kjellsdotter A, Berglund M, Jebens E, Kvik J, Anderson S. To take charge of one's life-group based education for patients with type 2 diabetes in primary care-a life world approach. *International Journal of Qualitative Studies on Health and Wellbeing*. 2020; 15(1):1726856, doi: 10.1080/17482631.2020
15. Centres for Disease Control and Prevention. National diabetes statistics report, 2017. [Available at <http://www.cdc.gov/diabetes/data/statistics/2015report.html>] [Accessed on 5 October 2021]

16. American Diabetes Association. Standards of medical care in diabetes 2015. *Diabetes Care*. 2015; 35(Suppl 1):S11-S61.
17. World Medical Association. World Medical Association Declaration of Helsinki; Ethical principles for medical research involving human subjects. *Journal of American Medical Association*. 2013; 310:2191-2194. [CrossRef]
18. Bryne B. Structural equation modeling with AMOS. In *Basic Concepts, Applications, and Programming*. New York, NY, USA: Taylor & Francis Group LLC; 2010.
19. Steinsbekk A, Rygg L, Lisulo M et al. Group based diabetes self-management education compared to routine treatment for people with type 2 diabetes mellitus. A systematic review with meta-analysis. *BMC Health Serv Res*. 2012; 12:213. [Available at <https://doi.org/10.1186/1472-6963-12-213> [Accessed on 5 October 2021]]
20. Kumari G, Singh V, Jhingan AK, Chhajar B, and Dahiya S. Effectiveness of lifestyle modification counseling on glycemic control in T2D patients in Delhi, India. *Current Research in Nutrition and Food Science*. 2019; 6:1.
21. Guatum A, Bhatta DN, Aryal UJ. Diabetes related knowledge, attitude and practice among diabetic patients in Nepal. *Bio Med Central Endocrinology Disorder*. 2015; 5(15):25.
22. Gavvani RM, Poursharifi H, Aliasgarzadeh A. The Effectiveness of Information-Motivation and Behavioral skill (IMB) model in improving self-care behaviors & HbA1c measure in adults with type2 diabetes in Iran-Tabriz. *Procedia Social and Behavioral Sciences*. 2010; 5:1868–1873.
23. Karaoui LR, Deeb ME, Nasser L, Hallit S. Knowledge and practice of patients with diabetes mellitus in Lebanon. *BMC Public Health*. 2018; 18(1):525. doi:10.1186/s12889-018-5416-7 [PMID:29678148]
24. Fatema K, Hossain S, Natasha K, Chowdhury HA, Akter J, Khan T, Ali L.. Knowledge attitude and practice regarding diabetes mellitus among non-diabetic and diabetic study participants in Bangladesh. *BMC Public Health*. 2017; 17(1):364.
25. Abdullah A, Peeters A, De Courten M, Stoelwinder J. The magnitude of association between overweight and obesity and the risk of diabetes: a meta-analysis of prospective cohort studies. *Diabetes Research and Clinical Practice*. 2010; 89(3):309-19.
26. Herath HMM, Weerasinghe NP, Dias H, Weerathna NP. Knowledge, attitude and practice related to diabetes mellitus among the General public in Galle district in Southern Sri Lanka. *Bio Med Central Public Health*. 2017; 17(1):535. [Available at <https://doi.org/10.1186/S12889-017-4459-5> [Accessed on 5 October 2021]]
27. Liddon L, Kingerlee R, Barry JA. Gender differences in preferences for psychological treatment, coping strategies and triggers to help-seeking. *Br J Clin Psychol*. 2018 Mar; 57(1):42-58. doi:10.1111/bjc.12147. Epub 2017 Jul. PMID: 28691375.
28. Shahzad A, Ahmed M, Anwer I, Ijaz N, Shahzad M, Muhammad U. Gender specific knowledge of diabetes and its management among patients visiting outpatient clinics in Faisalabad, Pakistan; 2018.
29. Pelullo CP, Rossiello R, Nappi R, Napolitano G, Di Giuseppe G. Diabetes prevention: Knowledge and perception of risk among Italian population. *Bio Med Research International*. 2019. [Available at <https://doi.org/10.1155/2019/2753131> [Accessed on 5 October 2021]]
30. Chawla S, Kaur S, Bharti A, Grag R, Kaur M, Sion D, Gosh A, Pal R. Impact of health education on knowledge attitude, practice and glycemic control in type 2 diabetes mellitus. *Journal of Family Medicine and Primary Eye Care*. 2019; 8(1):261-268.
31. Pal R, Pal S, Ankur B, Ghosh MK. Health education intervention on Diabetes in Sikkim. *Indian Journal of Endocrinology and Metabolism*. 2010; 14(1):3-7.
32. Dos Santos PF, Dos Santos PR, Ferrari GS, Fonseca GA, Ferrari CK. Knowledge of diabetes mellitus. *Osong Public Health Res Perspect*. 2014; 4:4. [Available at <http://dx.doi.org/1.1016/j.phrp.2014.06.004> [Accessed on 5 October 2021]]
33. Ahmed MM, El Degwy HM, Ali MI, Hegazy NH. The effect of educational intervention on knowledge, attitude and glycemic control in patients with type 2 diabetes in Port Said City, Egypt. *International Journal of Community Medicine and Public Health*. 2015; 2(3):302-307.
34. Shirinzadeh M, Afshin-Pour B, Angeles R, Gaber J, Agarwal G. The effect of community-based programs on diabetes prevention in low and middle-income countries: a systematic review and meta-analysis. *Global Health*. 2019; Feb 1; 1591):10. doi:10.1186/s12992-019-0451-4. PMID:30709362; PMCID: PMC6359819.

**Tables**

**Table 1. Diabetes Prevention Practices Scores of Community Dwelling Adults in Anambra Central Senatorial District Before and After Health Intervention**

N	Pretest Mean	SD	Posttest Mean	SD	Gained Mean
276	7.20	2.28	9.93	3.60	2.73

**Table 2. Diabetes Prevention Practices Scores of Community Dwelling Adults in Anambra Central Senatorial District before and After Health Intervention Based on their Ages**

Age Range	Pre-test			Post-test			Mean Gain Score
	N	Mean	SD	N	Mean	SD	
Below 50 Years	143	7.20	2.52	143	9.50	3.47	2.30
50 Years and above	133	7.20	2.00	133	10.39	3.68	3.19

**Table 3. Diabetes Prevention Practices Scores of Male and Female Community Dwelling Adults in Anambra Central Senatorial District before and After Health Intervention**

Gender	Pre-test			Post-test			Mean Gain Score
	N	Mean	SD	N	Mean	SD	
Male	64	7.56	2.36	64	8.72	3.10	1.16
Female	212	7.09	2.25	212	10.30	3.66	3.21

**Table 4: Diabetes Prevention Practices Scores of Community Dwelling Adults in Anambra Central Senatorial District before and After Health Intervention Based on their Educational Level**

Educational Level	Pre-test			Post-test			Mean Gain Score
	N	Mean	SD	N	Mean	SD	
Low Educational Level	178	7.06	2.21	178	10.02	3.59	3.14
High Educational Level	98	7.46	2.39	98	9.78	3.60	2.32

**Table 5: Summary of Analysis of Covariance on the Mean Diabetes Prevention Practices Scores of Community Dwelling Adults in Anambra Central Senatorial District by Age, Gender and Education Level**

Source	SS	df	MS	F	p-value
Pretest	.108	1	.108	.009	.923
Age	67.888	1	67.888	5.860	.016
Gender	117.140	1	117.140	10.112	.002
Educational Status	17.385	1	17.385	1.501	.222
Age * Gender * Education Level	82.672	1	82.672	7.137	.008
Error	3092.958	267	11.584		
Total	30777.000	276			



### Estimated Marginal Means of Diabetes Prevention Educational Status = Low Edu

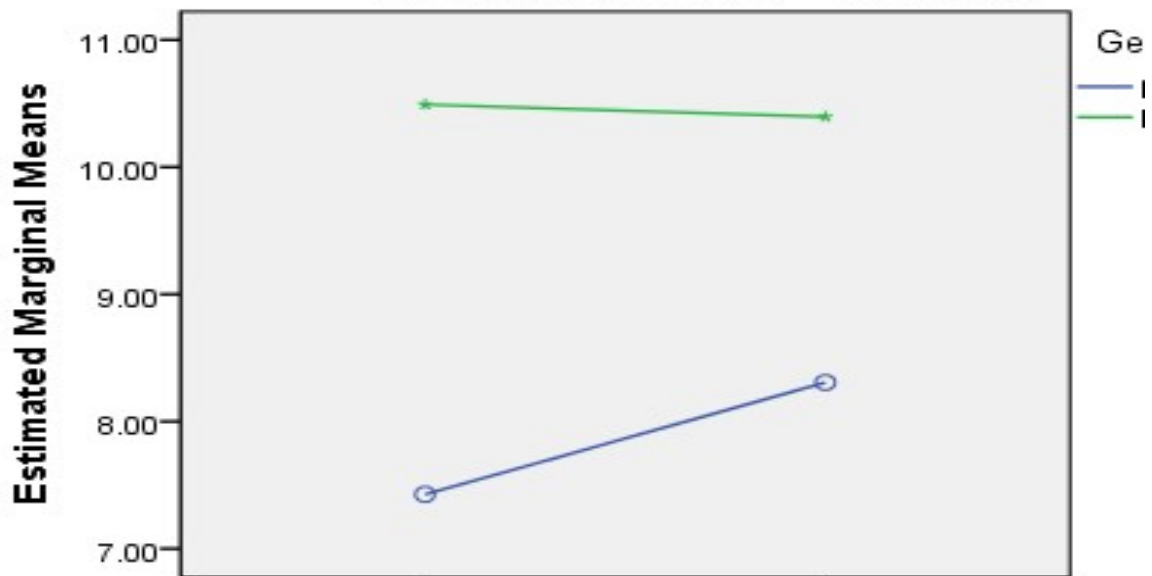


Figure 1: mean diabetes prevention practices scores of community dwelling adults in Anambra Central Senatorial District before and after health education intervention by age, gender and educational status

### Estimated Marginal Means of Diabetes Prevention P at Educational Status = High Education

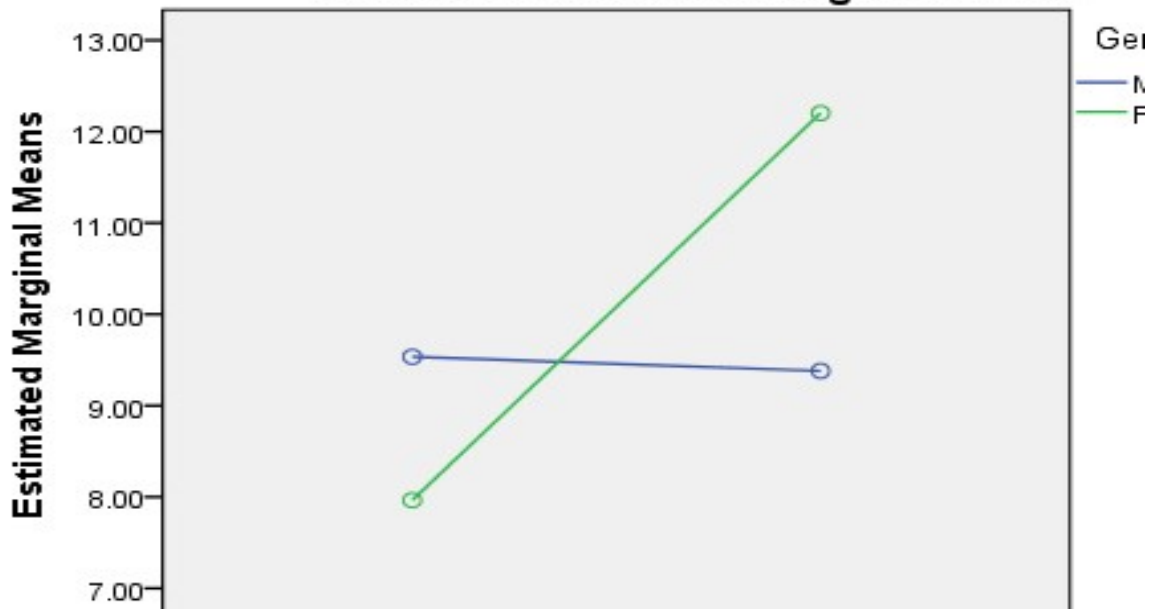


Figure 2: mean diabetes prevention practices scores of community dwelling adults in Anambra Central Senatorial District before and after health education intervention by age, gender and educational status