BOHR International Journal of Current Research in Diabetes and Preventive Medicine
2023, Vol. 1, No. 2, pp. 52–56
DOI: 10.54646/bijrdpm.2023.10
www.bohrpub.com

RESEARCH

Effectiveness of education-based diabetes intervention on diabetes-related knowledge among persons over 60 years: An experimental study

Uchenna Cosmas Ugwu*†, Ifeanyi Dandy Ogbonna and Osmond Chukwuemeka Ene

Department of Human Kinetics and Health Education, Faculty of Education, University of Nigeria, Nsukka, Nigeria

***Correspondence:**
Uchenna Cosmas Ugwu,
uchennacos.ugwu@unn.edu.ng

†**ORCID:**
Uchenna Cosmas Ugwu,
0000-0002-2882-5413

Received: 03 October 2023; **Accepted:** 16 November 2023; **Published:** 13 December 2023

Worldwide, diabetes mellitus (DM) is a major health challenge to the elderly population. This study evaluated the effectiveness of education-based diabetes intervention (EBDI) on diabetes-related knowledge (DRK) among persons over 60 years. It also determined the significant differences within study groups and demographic variables of the participants. An experimental research design employing pre- and post-test measures involving intervention (n = 410) and control (n = 410) groups was adopted. A sample size of 820 eligible participants were investigated. The content of EBDI was taught to the participants in the intervention group. Data collection was done using a "Diabetes-Related Knowledge Questionnaire (DRKQ)" demonstrating a reliability index of 0.82. Using frequency counts, percentage scores and independent chi-square statistics, all data were analyzed at a significance level of 0.05. It was found that EBDI has a significant effect on DRK of the participants (81%). Additionally, there was a significant difference in demographic variables of alcohol consumption, tobacco intake, and marital status (p-value < 0.05) while none was found in gender, age, and education (p-value > 0.05). Also, a significant difference was recorded in the study groups on DRK pretest measures ($p < 0.001$) while none existed in the groups on DRK post-test scores ($p > 0.870$). The study concluded that EBDI is significantly effective on DRK among persons over 60 years in Nigeria. Therefore, the need for educational institutions and care providers to adopt reliable education-based intervention such as EBDI, to maximize diabetes care to the elderly population particularly in Nigeria becomes paramount.

Keywords: diabetes-related knowledge, education-based diabetes intervention, effectiveness, elderly person, survey

1. Introduction

Worldwide, diabetes mellitus (DM) is among the major disorders presenting significant threat to the human population with high vulnerability among persons over 60 years and pregnant women, where it presents adverse consequences during first-time pregnancy (1–4). The disease condition is a global issue with prevalent records in developing and developed countries, including the United Kingdom (UK) (2), United States of America (USA) (1), Southeast Asian regions (5, 6), and Nigeria (7). The situation of DM among persons in advanced ages particularly in developing nations, such as Nigeria, is more critical due to limited access to diabetes care services, ignorance of the disease, poor diet, and lifestyle. The onset of DM is characterized by the body's inability to tolerate carbohydrate (3). Surprisingly, the adverse effect of DM extends to the unborn babies with notable neonatal challenges and deformities (1, 4). The manifestation of DM is

Abbreviations: DRK, Diabetes Related Knowledge; DRKQ, Diabetes Related Knowledge Questionnaire; EBDI, Education-Based Diabetes Intervention.

correlated with demographic variables of gender, age, marital status, education, tobacco intake, and alcohol consumption (8, 9). Inadequate knowledge of DM is a potential limitation to its prevention, resulting in high mortality and morbidity in the population. The quality of DM knowledge among different population cohorts is very poor (10–12), thus, indicating more complicated and dissatisfying reports if drastic measures are neglected (1–9).

Considering the epidemiological reports regarding DM with its pronounced poor knowledge status, preferences are given to educational interventions with emphasis on the potential risk factors, signs and symptoms, management, treatment, and prevention. The present study considered a valid intervention called "Education-Based Diabetes Intervention (EBDI), as an essential tool to improve the quality of DM-related knowledge, thereby preventing DM occurrences, and for possible management of DM condition in the elderly population. The EBDI is structurally designed through expert validation and authentication, to enhance elderly peoples' knowledge relating to DM. The content of EBDI is constructively validated to improve DM knowledge based on established principles and philosophical assumptions and also in accordance with high-profile published studies with significant similarities (13–16). The extent of DM control, management, prevention, treatment and coping depends majorly on the quality of DM knowledge (17–19). In addition, care support and professional assistance are essential in complying with monitoring of glucose level, dietary intake, and physical exercises among patients (20). Studies quantifying the effectiveness of interventions on DM knowledge particularly in Nigeria are lacking as evidenced in literature reviewed. Therefore, this study basically evaluated the effectiveness of Education-Based Diabetes Intervention (EBDI) on diabetes-related knowledge (DRK) among persons over 60 years. It also determined the significant differences within study groups and demographic variables of the participants.

2. Materials and methods

2.1. Research design

An experimental research design employing pre- and post-test measures involving intervention and control groups was adopted. All the participants were involved in the two interval assessments. Those in the control group were not exposed to the content of the intervention package.

2.2. Participants and recruitment procedures

A total of 820 persons over 60 years were recruited from the six major geopolitical zones that formed Nigeria during the months of February 2023 and June 2023. Using different media platforms and printed materials, awareness regarding the study to the prospective participants was disseminated in all the zones. The state pension offices in the sampled zones served as the point of contact since the majority of the prospective study participants were retirees from state civil service. With the consent of the participants fully demonstrated in writing, eligible participants were successfully recruited. The participants were equally availed with the opportunity to withdraw from the study at will. Individuals who were below 60 years of age and those who did not sign the consent forms were completely excluded from the study. In accordance with scholarly recommendation (21), individuals who met the eligibility requirements were allocated randomly into one of the groups by the researchers. The content of the EBDI was successfully administered to the eligible persons in the intervention group in a duration of 45 min per session, once in a week for 4 weeks. Two main intervals of assessments were carried out: (a) pretest – which was observed at the beginning of the intervention, and (b) post-test – which was done at the end of the intervention. All the eligible participants were involved in the two interval assessments. The content of EBDI was written in very simple English language for easy comprehension and clarity. The intervention exercise was implemented in six different venues as agreed by the participants and the investigators. The participants in different groups were assessed independently (in-time and in-intervals) by the investigators in order to eliminate all forms of bias. The quantitative scores were blinded and handled separately until the end of all the statistical procedures.

2.3. Instrument for data collection

Data collection was done using a "Diabetes-Related Knowledge Questionnaire (DRKQ)" demonstrating a reliability index of 0.82. The DRKQ was adapted (22). The content of DRKQ covered the meaning of diabetes, predisposing factors, dietary knowledge, diabetes management, control and treatment, as well as adverse health effects. In a multiple-choice response options of 4 in each statement in the DRKQ, a correct answer was indicated and thus attracting a point. The range of scores was zero to 15 (9), implying that below 60% reflected poor knowledge, while 60% and above represented high knowledge. The study explored the participants' demographic variables such as gender, alcohol consumption, chronological age, tobacco intake, marital status, and educational level.

2.4. Statistical analysis

Statistical data were computed using SPSS statistics 22.0 version (23). Frequency counts, percentage scores, and

independent chi-square statistics were used to establish the effectiveness of EBDI on DRK among persons over 60 years in Nigeria at a significance level against the probability value of less than 0.05. The ethical permit was received from Ethics Sub-Committee of the University of Nigeria, Nsukka, following the stipulated principles, guidelines, and regulations as established by the Declaration of Helsinki for conducting studies of this kind.

3. Results

A complete data analysis was done on 820 persons over 60 years who met the eligibility requirements for the study. The number of male participants (62%) was higher than that of the females (38%) in the intervention group, and that of male participants (46%) was lower than that of female participants (54%) in the non-intervention group, without statistical difference ($p = 0.603 > 0.05$). More than two-thirds (72%) of the participants consume alcohol in the treatment group while less than one-third (28%) do not; and approximately two-thirds (66%) of them consume alcohol in control group while slightly above one-third (34%) do not, with significant difference ($p = 0.038 < 0.05$). Only 43% of the participants were 70 years and above, and more than half (57%) were 60–70 years in the treatment group, without statistical difference ($p = 0.109 > 0.05$). Only 39% of them use tobacco, and approximately two-thirds (61%) do not in the intervention group; more than half of the participants (62%) took tobacco and only 38% of them did not take tobacco in the non-treatment group, with a difference (p-value $= 0.026 < 0.05$). Approximately three-quarters of the participants (73%) were married, only 27% of them were in other marital union in the intervention group; three quarters of the participants (75%) were married while only 25% were in other marital union in control group, with a difference ($p = 0.010 < 0.05$). Three-quarters of the participants (75%) had a university degree while only 25% had other degrees in the intervention group; only 38% of the participants had other degrees while more than half of them (62%) had university degrees in the non-treatment group, without statistical difference ($p = 0.291 > 0.05$). (Full details are presented in **Table 1**).

There was a significant difference in the study groups in DRK pretest measures ($p < 0.001$) while none existed in the groups in DRK post-test scores ($p > 0.870$). (Full details are presented in **Table 2**).

4. Discussion

This study quantified the effectiveness of education-based intervention (EBDI) on the quality of knowledge relating to DM among persons over 60 years. The experimental approach adopted in the study intensified its strength as well as the statistical outcomes. Some significant implications are linked with our findings. For instance, reliable interventions are frameworks for knowledge acquisition and creating awareness regarding diseases. On the other hand, the findings filled the existing research gap in this area of study as the findings of the study can be referenced. Finally, the educational institutions, care providers, and policy-makers can leverage on the study outcomes in improving, modifying, and initiating other means or approaches in handling diabetes cases. In our study, the significant effect of EBDI on DRK among persons over 60 years was established. This was demonstrated on the statistical scores of individuals in the experimental group as varied with the participants in the conventional group as contained in the post-test assessments. Secondly, the significant effect of the intervention was proved when the statistical outcomes of pre- and post-test measures of the participants in the intervention group are set for comparison. The statistical differences in the percentage scores of the groups are justified and linked with the treatment given and thus its effect. Also, this finding is a clear indication that successful application of interventions on health complications that are peculiar to elderly persons would be very effective in deepening the etiology and possible mechanism for control, management, and prevention. A similar study justifies that disease management and prevention depends on one's knowledge and understanding (9). Our findings are in accordance with other studies with huge similarities. A study of healthcare workers revealed effectiveness of a validated program on the sampled group (13). Also, a reliable study conducted on 215 people with Type 2 diabetes reported the significant effect of a validated program on the participants' knowledge of diabetes (14). Also, a similar study involving 103 eligible participants revealed that diabetes education program was significantly effective on physical exercises of Type 2 diabetic patients (15). Similarly, a significant effect of educational intervention in attaining positive and quality health outcomes on diabetic patients was reported (24). Also, a similar significant effect was recorded (16). These outcomes are expected to form the basis for the development and validation of effective diabetes care centers for persons in all the geopolitical zones in Nigeria.

The strength of our study research lies primarily in the use of appropriate methodologies, population, and statistical approach while its weakness is demonstrated in the use of questionnaire for data collection which limited the responses to the structured items. Similar studies are recommended to allow for qualitative assessment of the participants. The quality of knowledge if properly assessed by allowing participants' view and experiences would be more robust and convincingly presented for effective generalization. Also, further study that would encourage follow-up is recommended using the same population cohort.

TABLE 1 | Demographic information of the participants and significant differences (*N* = 820).

Parameter	Variable	Intervention group (*n* = 410) f(%)	Control group (*n* = 410) f(%)	Chi-square	*P*-value
Gender	Male	254 (62)	188 (46)	3.901	0.603**
	Female	156 (38)	222 (54)		
Alcohol Consumption	Yes	298 (72)	269 (66)	1.532	0.038*
	No	112 (28)	141 (34)		
Chronological Age	70 years and above	177 (43)	198 (48)	0.880	0.109**
	60-69 years	233 (57)	212 (52)		
Tobacco Intake	Yes	161 (39)	256 (62)	2.529	0.026*
	No	249 (61)	154 (38)		
Marital Status	Married	301 (73)	306 (75)	0.861	0.010*
	Others	109 (27)	104 (25)		
Education Level	University Degree	308 (75)	255 (62)	1.543	0.291**
	Others	102 (25)	155 (38)		

Keys: n, sample size, %, percentage, (), bracket sign, **, not significant, *, significant.

TABLE 2 | Analysis of significant differences within study groups of the participants (*N* = 820).

Instrument	Interval	Group	Percentage score	Chi-square	*P*-value
DRKQ	Pretest (n = 820)	Intervention (n = 410)	164 (43%)	5.410	0.001*
		Control (n = 410)	230(56%)		
DRKQ	Post-test (n = 820)	Intervention (n = 410)	332(81%)	0.991	0.870**
		Control (n = 410)	180(44%)		

DRKQ, diabetes-related knowledge questionnaire, %, percentage, **, not significant, *, significant.

5. Conclusion

The study concluded that EBDI is significantly effective on DRK of persons over 60 years in Nigeria. Therefore, the need for educational institutions and care providers to adopt reliable education-based intervention such as EBDI to maximize diabetes care to elderly population particularly in Nigeria becomes paramount.

References

1. Ferrara A, Kahn HS, Quesenberry CP, Riley C, Hedderson MM. An increase in the incidence of gestational diabetes mellitus: Northern California, 1991-2000. *Obstet Gynecol.* (2004) 103:526–33.
2. Rowan JA, Hague WM, Gao W, Battin MR, Moore MP, MiG Trial Investigators. Metformin versus insulin for the treatment of gestational diabetes. *N Engl J Med.* (2008) 358:2003–15.
3. Sapienza A, Francisco R, Trindade T. Factors predicting the need for insulin therapy in patients with gestational diabetes mellitus. *Diabetes Res Clin Pract*. (2010) 88:81–6.
4. Pratipanawatr W, Pratipanawatr T. Glibenclamide (Glyburide) versus insulin for the treatment of gestational diabetes mellitus: a meta-analysis. *Khon Kaen Med J.* (2010) 32:155–66.
5. Idris N, Hatikah CC, Murizah M, Rushdan M. Universal versus selective screening for detection of gestational diabetes mellitus in a Malaysian population. *Malays Fam Physician*. (2009) 4:83–7.
6. Hirst J, Raynes-Greenow C, Jeffery H. A systematic review of trends of gestational diabetes mellitus in Asia. *J Diabetol.* (2012) 3:4.
7. Wokoma F, John C, Enyindah C. Gestational diabetes mellitus in a Nigerian antenatal population. *Trop J Obstetr Gynecol.* (2001) 18:2.
8. Anna V, Ploeg HP, Cheung NW, Huxley RR, Bauman AE. Socio-demographic correlates of the increasing trend in prevalence of gestational diabetes mellitus in a large population of women between 1995 and 2005. *Diabetes Care.* (2008) 31:2288–93.
9. Hussain Z, Yusoff Z, Sulaiman S. Gestational diabetes mellitus: Pilot study on patient's related aspects. *Arch Pharma Pract.* (2014) 5:84–90.
10. Carolan M, Steele C, Margetts H. Attitudes towards gestational diabetes among a multiethnic cohort in Australia. *J Clin Nurs.* (2010) 19:2446–53.
11. Shriraam V, Rani MA, Sathiyasekaran BW, Mahadevan S. Awareness of gestational diabetes mellitus among antenatal women in a primary health center in South India. *Indian J Endocrinol Metab.* (2013) 117:146–8.
12. Moran A, Hessett C, Pooley J, et al. An assessment of patients' knowledge of diabetes, its management and complications. *Pract Diabetes Int.* (1989) 6:265–7.
13. Prezio EA, Cheng D, Balasubramanian BA, Shuval K, Kendzor DE, Culica D, et al. Community Diabetes Education (CoDE) for uninsured Mexican Americans: a randomized controlled trial of a culturally tailored diabetes education and management program led by a community health worker. *Diabetes Res Clin Pract.* (2013) 100:19–28.
14. Rashed OA, Sabbah HA, Younis MZ, Kisa A, Parkash J. Diabetes education program for people with type 2 diabetes: An international perspective. *Eval Program Plann*. (2016) 56:64–8.
15. Mendes GF, Nogueira JA, Reis CE, Meiners MM, Dullius J. Diabetes education program with emphasis on physical exercise in subjects with type 2 diabetes: a community-based quasi-experimental study. *J Sports Med Phys Fitness.* (2017) 57:850–8.

16. Marincic PZ, Salazar MV, Hardin A, Scott S, Fan SX, Gaillard PR, et al. Diabetes Self-Management Education and Medical Nutrition Therapy: A Multisite Study Documenting the Efficacy of Registered Dietitian Nutritionist Interventions in the Management of Glycemic Control and Diabetic Dyslipidemia through Retrospective Chart Review. *J Acad Nutr Diet*. (2019) 119:449–63.
17. Roter DL, Hall JA, Merisca R, Nordstrom B, Cretin D, Svarstad B. Effectiveness of interventions to improve patient compliance: A meta-analysis. *Med Care.* (1998) 36:1138–61.
18. Sousa VD, Zauszniewski JA, Musil CM, Lea PJ, Davis SA. Relationships among self-care agency, self-efficacy, self-care, and glycemic control. *Res Theory Nurs Pract.* (2005) 19:217–30.
19. Funnell M, Brown T, Childs B. National standards for diabetes self-management education. *Diabetes Care.* (2009) 32:S87–94.
20. Ellis SE, Speroff T, Dittus RS, Brown A, Pichert JW, Elasy TA. Diabetes patient education: A meta-analysis and meta-regression. *Patient Educ Couns.* (2004) 52:97–105.
21. Saghaei M. *Random Allocation Software [Computer Software]*. (2014). Retrieved from http://mahmoodsaghaei.tripod.com/Softwares/randalloc.html
22. Eigenmann C, Skinner T, Colagiuri R. Development and validation of a diabetes knowledge questionnaire. *Pract Diabetes Int.* (2011) 28:166-70.
23. IBM Corp. *IBM SPSS Statistics for Windows, version 22.* Armonk, NY: IBM Corp (2013).
24. Salahshouri A, Alavijeh FZ, Mahaki B, Mostafavi F. Effectiveness of educational intervention based on psychological factors on achieving health outcomes in patients with type 2 diabetes. *Diabetol Metab Syndr.* (2018) 10:67.