

Relationship between family dynamics and glycemic control among adults with type 2 diabetes mellitus presenting at Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

Latifatu B. Abdulsalam^{1*}, Simon Pitmang², Anas S. Sabir³, Lawal K. Olatunji⁴

¹Department of Family Medicine, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria

²Department of Family Medicine, Jos University Teaching Hospital, Jos, Nigeria

³Department of Internal Medicine, Usmanu Danfodiyo University, Sokoto, Nigeria

⁴Sokoto State Ministry of Health, Sokoto, Nigeria

ABSTRACT

Background: The incidence of diabetes mellitus, especially type 2, is rapidly growing in the world, and the family dynamics is believed to play major roles in the adequacy of glycemic management in diabetic patients. **Aim:** This study aimed to determine the relationship between family dynamics and glycemic control among patients with type 2 diabetes mellitus in Sokoto, Nigeria. **Materials and Methods:** A cross-sectional study was conducted among 271 adults with type 2 diabetes mellitus (selected by systematic sampling technique) attending the Family Medicine Department clinics of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Blood samples were collected and analyzed for glycosylated hemoglobin in addition to questionnaire administration. Data were analyzed using IBM SPSS version 20 statistical computer software package. **Results:** The ages of the participants ranged from 26 to 80 years with a median age of 50.00 years, and majority of them (55.4%) were males. Most of the participants were married (81.5%), and majority of them (61.7%) were in a polygamous family setting. Majority of participants had balanced families as they scored high marks in the cohesion, communication, flexibility, and satisfaction scales, but low marks in the enmeshed, chaotic and disengaged scales. Only a few, 23 (8.5%) of the 271 participants had good glycemic control, and it was associated ($p < 0.05$) with high scores on balanced cohesion and family communication scales, and low score on disengagement scale. **Conclusion:** Although, majority of the participants in this study had balanced families, only a few of them had good glycemic control, and it was associated with high scores on balanced cohesion and family communication scales, and low score on disengagement scale. Care providers should routinely assess the family dynamics of diabetic patients and also involve their family members in the management of their disease conditions.

Keywords: Family dynamics, glycemic control, type 2 diabetes mellitus, patients

INTRODUCTION

Chronic diseases are now the major causes of death and disability globally; it has been estimated that they account for 70% of deaths worldwide but disproportionately affect low- and middle-income countries where they account for about two-thirds of the disease burden (WHO, 2011; World Bank, 2011). Regrettably, these countries bear the dual burden brought about by infectious and chronic diseases. Diabetes mellitus (DM) is undoubtedly for them a public health concern epidemiologically and economically as it is associated with reduced life expectancy, significant morbidity (due to specific diabetes related micro-

vascular complications such as retinopathy, nephropathy, and neuropathy), and increased risk of macro-vascular complications such as ischemic heart disease, stroke and peripheral vascular disease; and the development of these complications impacts substantially on both the productivity and quality of life of diabetic patients (WHO, 2011; World Bank, 2011). In addition, DM accounts for 3.8 million deaths worldwide per year, a number similar in magnitude to the mortality attributed to HIV/AIDS (Bahremand et al., 2015). Studies suggest that these deaths can be prevented, especially in economically productive individuals

*Corresponding Author: Dr. Latifatu B. Abdulsalam, Department of Family Medicine, Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. E-mail: bolanleabdulsalam@yahoo.com

Received: 07-11-2019

Revised: 30-11-2019

Published: 23-12-2019

between the ages of 35 and 64 years of age (Haddadi and Besharat, 2010; Nozaki et al., 2009). The incidence of diabetes, especially type 2, is rapidly growing in the world, in 1985, an estimated 30 million people suffered with this chronic disease, which, by the end of 2006, had increased to 230 million, representing 6% of the world population; of this number, 80% is found in the developing world (Haddadi and Besharat, 2010; DiMatteo, 2004).

Diabetes mellitus was previously thought to be rare in rural Africa, but over the past decades it has emerged as an important non-communicable disease in sub-Saharan Africa (ADA, 2010). Approximately, 7.1 million Africans were said to be suffering from diabetes at the end of 2000, and this figure is expected to rise to 18.6 million by 2030 (Pereira et al., 2008). Similar to the situation in many sub-Saharan African countries, the prevalence of DM continues to rise in Nigeria, and it was estimated to have risen from 2.2% in 1997 to 8.5% in 2008 [Ogbera and Ekpebegh, 2014; WHO, 2011]. A cause for concern is the generally poor glycemic control reported in studies conducted among patients with type 2 DM in the country [Unadike et al., 2010; John et al., 2005]. Glycemic control refers to the typical levels of blood sugar in a person with diabetes mellitus. Since blood sugar levels fluctuate throughout the day and glucose levels are imperfect indicators of these changes, the percentage of hemoglobin which is glycosylated [i.e., glycosylated hemoglobin (HbA1C)] which reflects the average glucose levels over the preceding 2-3 months is used as a proxy measure of long-term glycemic control.

Family dynamics is the forces at work within the family that produce particular behavior and symptom (Garcia-Hudobro et al., 2012). Family dynamics describes how one individual perceives another family member's attitude about his role in the family unit, the effect that perception has on the way those two family members relate to each other and consequences for other family members based on that interaction in other words functionality of the family. Family dynamics is objectively measured by the level of functioning of the family and it comprises many psychosocial factors that are protective against the adverse effects of chronic diseases on the family (George, 2016; Batty and Fain, 2016). These include adaptability and flexibility of the dynamics of the family to stressful situations, as well as connectedness, communication, cohesion and satisfaction among the members of the family. Flexibility as a measure of family functioning varies from rigid, structured, and flexible to chaotic. Cohesion varies from disengaged, separated, connected to enmesh. A balanced

family may be flexible-connected, flexibly-separated, structurally-separated or structurally-connected. An unbalanced family combines the extremes of these measures in chaotically-disengaged, chaotically-enmeshed, rigidly-disengaged and rigidly-enmeshed (He et al., 2014).

Diabetes management can be quite complex, requiring lifelong commitment and drastic changes to the patient's lifestyle so involving family members as a part of diabetes management plays a major role (Rosland et al., 2010; Armour et al., 2005). Psychosocial variables which included family functioning was said to help in better control of glycemic level than oral hypoglycemic agents alone in management of type 2 diabetes (Openshaw, 2011). Social support from family provides patients with practical help and can buffer the stresses of living with illness. It was found that practical and emotional support received from both family and friends had a positive influence on global measures of disease management in patients with diabetes (Olson and Gorall, 2003). In fact, a meta-analytic review of 122 empirical studies found that adherence was 27% higher when patients had practical support available to them (Winek, 2010). Additionally, research by Pereira et al. (2008) indicates strong associations between positive family dimensions (e.g., cohesion and familial guidance) and better glycemic control among diabetic patients (Mbanya and Gill, 2004).

With regard to family cohesion, in which families are described as warm, accepting, and close, the odds of adherence were three times higher when compared with non-cohesive families (Winek, 2010). Good level of cohesion, flexibility and communication help in better resilience in family, and thus take care of stress in the family (Jones et al., 2008). However, despite the high burden of DM in Nigeria [Ogbera and Ekpebegh, 2014; WHO, 2011], and the documented positive effects of family dynamics on glycemic management worldwide, there is a dearth of literature on the relationship between family dynamics and glycemic control in Nigeria, and it has never been examined in Sokoto, Nigeria. This study was conducted to determine the relationship between family dynamics and glycemic control among adults with type 2 diabetes mellitus presenting at UDUTH, Sokoto, Nigeria.

MATERIALS AND METHODS

Study Design, Population and Area

A cross-sectional study was conducted among adults with type 2 diabetes mellitus attending the Family Medicine Department clinics of Usmanu Danfodiyo

University Teaching Hospital, Sokoto, Nigeria, from January to April 2014. The hospital is a tertiary health institution which serves as a referral center for the health facilities in Sokoto State and the surrounding Kebbi, Zamfara, Katsina and Niger States. All adult patients (i.e., ≥ 18 years old) who have been diagnosed with type 2 diabetes mellitus for ≥ 1 year (and had no gross renal, ophthalmic, cardiovascular or psychiatric complications) and consented to participate were considered eligible for enrollment into the study, while those who were too ill to participate were excluded.

Sample Size Estimation and Sampling Technique

The sample size was statistically estimated at 271 and the eligible participants were selected by systematic sampling technique using the patients' attendance register to constitute the sampling frame. About 150 patients are seen at the clinics each day of which about 10% are diabetics; one of five patients that had been diabetic for ≥ 1 year was recruited as they present consecutively at the clinics over a period of 4 months until the estimated sample size of 271 was obtained.

Data Collection and Analysis

A semi-structured interviewer-administered questionnaire was used to obtain information on the participants' socio-demographic characteristics, while the Family Adaptability and Cohesion Evaluation Scale IV (FACES IV) questionnaire (Olson, 2011) was used to obtain information on the participants' family dynamics. The FACES IV questionnaire measures the dimensions of family cohesion and family flexibility using six scales. There are two balanced scales that assess balanced family cohesion and balanced family flexibility, and they are similar to FACES II. It also contains four unbalanced scales that assess the high and low extremes of cohesion (i.e., disengaged and enmeshment) and flexibility (i.e., rigid and chaotic). Blood samples were collected from the cubital or radial vein with an 18G needle and syringe into an ethylenediaminetetraacetic acid (EDTA) container and taken to the laboratory for analysis within 6 hours of collection. Analysis for glycosylated hemoglobin (HbA1C) was done using an automated spectrophotometer analyzer, and the results were entered into a data sheet. The glucose circulating in the blood enters the red blood cells resulting in formation of HbA1C which reflects the average blood glucose level over the preceding 2-3 months and it is widely used as the standard biomarker for the adequacy of glycemic management. The data on the participants' family dynamics were entered into FACES IV Excel program (Olson, 2010). The Excel program took each item response and summed them for each of the six FACE

IV scales, thereby creating a total raw score. The total raw score was converted into percentage score using the percentile conversion chart. Patients that scored high marks in the flexibility, cohesion, communication and satisfaction scales were considered as having balanced families, while patients that scored high in the unbalanced scales, the rigidity, enmeshed, chaotic and separateness scales were considered as having unbalanced families. The data on the socio-demographic variables and HbA1C levels were analyzed using the IBM SPSS version 20 computer statistical software package. Quantitative variables were summarized using descriptive statistics, while qualitative variables were summarized using frequencies and percentages. The Chi-square test was used to assess for relationships between the respective family dynamics scales and the HbA1C levels which were categorized into good glycemic control (HbA1C = 6-7%) and poor glycemic control (HbA1C = 8-19%) (ADA, 2010). All levels of statistical significance were set at $p < 0.05$.

Ethical Consideration

Ethical approval was obtained from the Ethical Committee of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria, and informed written consent was also obtained from the study participants before data collection.

RESULTS

Socio-demographic characteristics of participants

All the 271 questionnaires administered were adequately completed and found suitable for analysis, giving a response rate of 100%. The ages of the participants ranged from 26 to 80 years with a median age of 50.00 years, and majority of them (55.4%) were males. Most of the participants were married (81.5%) and practiced Islam as religion (82.6%). Only about half of the participants (50.9%) had formal education, and majority of them (61.7%) were in a polygamous family setting (Table 1).

Participants' family dynamics and glycemic control status; and their relationship

Majority of participants had very connected (75.0%) and flexible (53.9%) families; the family communication level was just moderate in a larger proportion of participants (41.7%), and close to two-thirds (58.7%) had high or very high family satisfaction levels. Majority of participants had very low level of family disengagement (74.9%), and low or very low enmeshed family levels (73.0%). About half of participants (52.0%) had high or very high rigid family levels, but most of them (84.9%) had very low chaotic family level (Table 2). The participants'

glycated haemoglobin (HbA1C) values ranged from 6 to 19.0% with mean, median and modal levels of 9.67, 9.20, and 8.0% respectively. Only a few, 23 (8.5%) of the 271 participants had good glycemic control (Figure 1). Good glycemic control was associated ($p < 0.05$) with high scores on balanced cohesion and family communication scales, and low scores on disengagement scales (Table 3).

Table 1: Socio-demographic characteristics of participants

Variables	Frequency (%)
Sex (n = 271)	
Male	150 (55.4)
Female	121 (44.6)
Marital status (n = 271)	
Single	3 (1.1)
Married	221 (81.5)
Divorced	8 (3.0)
Widowed	39 (14.4)
Religion (n = 270)	
Islam	223 (82.6)
Christianity	47 (17.4)
Education level (n = 269)	
None	31 (11.5)
Quranic only	101 (37.6)
Primary	48 (17.8)
Secondary	38 (14.1)
Tertiary	51 (19.0)
Family setting (n = 269)	
Monogamous	103 (38.3)
Polygamous	166 (61.7)

DISCUSSION

This study assessed the relationship between family dynamics and glucose control among adult type 2 diabetes mellitus patients presenting at Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Majority (55.4%) of the participants in this study were males, this finding is in contrast to the finding in studied conducted in Ido-Ekiti, Nigeria (Fatusi *et al.*, 2016), and Lafia, Nigeria (Ndubuka *et al.*, 2016), in which majority of participants were females. This could be because due to the culture in northern Nigeria in which women are required to obtain permission from their husbands before going outside their homes. Also, in contrast to the finding in the study conducted in Ido-Ekiti, Nigeria, majority of the participants in this study (83.0%) were Muslims, this is because Sokoto, Nigeria is predominantly a Muslim community, and this also explains why majority of participants (61.0%) were in polygamous family setting since polygamy is allowed in Islam.

Table 2: Participants' family dynamics

Family dynamics	Frequency (%), n = 271
Balanced cohesion level	
Somewhat connected	5 (1.8)
Connected	61 (22.5)
Very connected	205 (75.0)
Balanced flexibility level	
Somewhat flexible	5 (1.8)
Flexible	146 (53.9)
Very flexible	120 (44.3)
Family communication level	
Very high	23 (8.5)
High	51 (18.8)
Moderate	113 (41.7)
Low	53 (19.6)
Very low	31 (11.4)
Family satisfaction level	
Very high	74 (27.3)
High	85 (31.4)
Moderate	48 (17.7)
Low	38 (14.0)
Very low	26 (9.6)
Disengaged level	
Very high	1 (0.4)
High	12 (4.4)
Moderate	15 (5.5)
Low	40 (14.8)
Very low	203 (74.9)
Enmeshed level	
Very high	2 (0.7)
High	10 (3.7)
Moderate	76 (28.0)
Low	122 (45.0)
Very low	61 (22.5)
Rigid level	
Very high	49 (18.1)
High	92 (33.9)
Moderate	78 (28.8)
Low	35 (12.9)
Very low	17 (6.3)
Chaotic level	
High	1 (0.4)
Moderate	8 (3.0)
Low	32 (11.8)
Very low	230 (84.9)

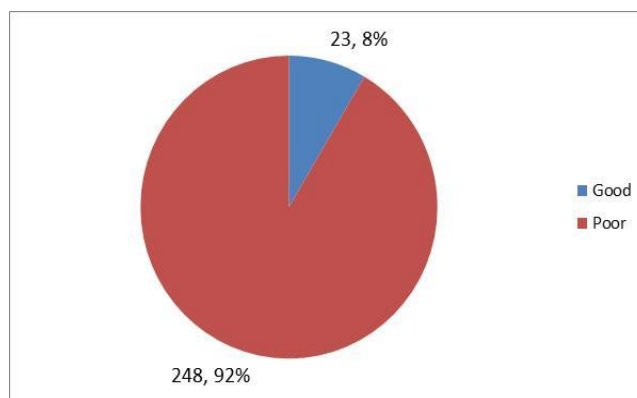


Figure 1: Participants' glycemic control status

Table 3: Distribution of glycemic control by participants' family dynamics

Family dynamics	Glycemic control status (n = 271)			Test of significance
	Good (HbA1C = 6-7%)	Poor (HbA1C = 8-19%)	Total	
	Frequency (%)	Frequency (%)	Frequency (%)	
Balanced cohesion level				
Somewhat connected	2 (8.7)	2 (0.8)	4 (1.5)	Fe χ^2 = 6.023, p = 0.048*
Connected	5 (21.7)	57 (23.0)	62 (22.9)	
Very connected	16 (69.6)	189 (76.2)	205 (75.6)	
Balanced flexibility level				
Flexible	12 (52.2)	136 (54.8)	148 (54.6)	χ^2 = 0.060, p = 0.806
Very flexible	11 (47.8)	112 (45.2)	123 (45.4)	
Family communication level				
Very high	2 (8.7)	21 (8.5)	23 (8.5)	χ^2 = 1.662, p = 0.038*
High	6 (26.1)	42 (16.9)	48 (17.7)	
Moderate	8 (34.8)	106 (42.7)	114 (42.1)	
Low	5 (21.7)	50 (20.2)	55 (20.3)	
Very low	2 (8.7)	29 (11.7)	31 (11.4)	
Family satisfaction level				
Very high	10 (43.5)	65 (26.2)	75 (27.7)	Fe χ^2 = 4.650, p = 0.310
High	4 (17.4)	81 (32.7)	85 (41.4)	
Moderate	5 (21.7)	41 (16.5)	46 (17.0)	
Low	3 (13.0)	35 (14.1)	38 (14.0)	
Very low	1 (4.3)	26 (10.5)	27 (10.0)	
Disengaged level				
Very high	2 (8.7)	1 (0.4)	3 (1.1)	Fe χ^2 = 9.168, p = 0.037*
High	0 (0)	11 (4.4)	11 (4.1)	
Moderate	0 (0)	16 (6.5)	16 (5.9)	
Low	2 (8.7)	38 (15.3)	40 (14.8)	
Very low	19 (82.6)	182 (73.4)	201 (74.2)	
Enmeshed level				
Very high	0 (0)	2 (0.8)	2 (0.7)	χ^2 = 2.012, p = 0.716
High	0 (0)	10 (4.0)	10 (3.7)	
Moderate	9 (39.1)	66 (26.6)	75 (27.7)	
Low	9 (39.1)	111 (44.8)	120 (44.3)	
Very low	5 (21.7)	59 (23.8)	64 (23.6)	
Rigid level				
Very high	8 (34.8)	44 (17.7)	52 (19.2)	Fe χ^2 = 3.491, p = 0.454
High	7 (30.4)	82 (33.1)	89 (32.8)	
Moderate	5 (21.7)	73 (29.4)	78 (28.8)	
Low	2 (8.7)	33 (13.3)	35 (12.9)	
Very low	1 (4.3)	16 (6.5)	17 (6.3)	
Chaotic level				
High	0 (0)	1 (0.4)	1 (0.4)	Fe χ^2 = 5.563, p = 0.148
Moderate	0 (0)	8 (3.2)	8 (3.0)	
Low	8 (34.8)	39 (15.7)	47 (17.3)	
Very low	15 (65.2)	200 (80.6)	215 (79.3)	

*Statistically significant; Fe: Fisher's Exact Test

Family functioning is one of the important aspects of family environment which may affect the physical, social and emotional health of individuals. In fact, what happens within a family and how the family functions are the crucial factors in creating flexibility and mitigating current and future risks associated with unfortunate events and unsuitable conditions (Ghamari and Khoshnam, 2011). In this study, the families of the participants were very connected (75%) and flexible (98%); this finding indicates high levels of closeness and support in their families. This is similar to the finding in a study by Fatusi *et al.* (2016) who also found that about

half of the respondents in their study had good family support (53.2%), even though a much higher level was obtained in this study. This could be because the Nigeria traditional culture is close-knitted, but at the same time flexible enough to allow an individual to do what he/she wants, but with supervision since there is closeness in the family. Family communication level was moderate in a larger proportion (41.7%) of the participants in this study, and with low proportions of participants reporting extreme levels of very high (8.7%) and very low (11.4%) communication. This finding is keeping with the traditional Nigerian culture where communication is not well encouraged; and it is

similar to the finding in a study conducted among adolescents with type 1 diabetes mellitus in Pakistan (Najmi *et al.*, 2013) where the level of communication among family members was found to be low. Communication among family members is said to improve the functioning of a family, and it is believed that if communication is improved among diabetic patients and their families, their glycemic control will concomitantly improve (Barnes and Olson, 1986).

Close to two-thirds (58.7%) of the participants in this study had high or very high family satisfaction levels, this could be related to the high proportion of participants (75.0%) with very connected families, as having a close knitted family most likely gave them satisfaction. This finding is in agreement with the finding in a study in New York (Trief *et al.*, 1998) that reported that patients with high family cohesion were satisfied with adaptation to their disease conditions. It is not surprising that majority of participants in this study (74.9%) had very low level of family disengagement (74.9%), and low or very low enmeshed family levels (67.5%) considering the high proportion of participants with connected and very connected families (97.5%), and those with flexible or very flexible families (98.2%) among them.

The high and very high rigid family levels in majority of the participants (52.0%) in this study could be due to the fact that the traditional African society is a disciplinarian society in which although the families are closely knitted, there are rules guiding the conduct of the individual family members, and there are strict penalties for offenders; this probably accounts for the finding of most of the participants in this study (84.9%) having very low chaotic family level.

The 9.67% mean glycosylated haemoglobin (HbA1c) level obtained among the participants in this study with only a few of them (8.5%) having good glycemic control is disturbing in view of the microvascular and macrovascular complications that are associated with poor glycemic control, and the negative impacts of these complications on their health status, quality of life and productivity (WHO, 2011; World Bank, 2011). While a study by Ndubuka *et al.* (2016) similarly reported poor glycemic control with a mean HbA1C level of 11.2% in a study conducted in Lafia, Nigeria, on the contrary, Fatusi *et al.* (2016) found a much better glycemic control with a mean Hb1AC of 7.07% (and with only 22.4% of participants having Hb1AC level above 7.0%) in a study conducted in Ido-Ekiti, Nigeria, and good glycemic control was associated with family closeness and support. The poor glycemic control among the

participants in this study could be due to poor drug compliance or inability to afford the drugs, and it brings to the fore the importance of family support in facilitating compliance to treatment among patients with chronic disease conditions.

The association between good glycemic control and high balanced cohesion and family communication levels, and also low disengagement levels in this study is in consonance with the findings in previous studies (Openshaw, 2011; Pereira *et al.*, 2008; Mbanya and Gill, 2004), as it is believed that a closely knitted family that communicates well help in achieving good glycemic control. In addition, it is believed that high performance regarding family functioning can help to develop the individual members' resilience, and enable them to enjoy better health (Openshaw, 2011; Winek, 2010; Jones *et al.*, 2008; Olson and Gorall, 2003). It is therefore necessary for care providers to routinely assess the family dynamics of diabetic patients, and also involve their family members in the management of their disease conditions, as it would enable their family members to better understand the health and social problems they are having, and to also provide them with the necessary support timely and consistently.

CONCLUSION

Although, majority of the participants in this study had balanced families, only a few of them had good glycemic control, and it was associated with high scores on balanced cohesion and family communication scales, and low score on disengagement scale. Care providers should routinely assess the family dynamics of diabetic patients and also involve their family members in the management of their disease conditions.

Acknowledgements

The authors appreciate the management of Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria, for giving the permission to conduct the study. They also appreciate all the patients that participated in the study for their cooperation.

Source of support

Nil.

Conflict of interest

None declared.

REFERENCES

- American Diabetes Association (2010). Diagnosis and classification of diabetes mellitus. *Diabetes Care*. 33(Suppl 1): S62–S69.

- Armour TA, Norris SL, Jack L Jr, Zhang X, Fisher L (2005). The effectiveness of family interventions in people with diabetes mellitus: a systematic review. *Diabet. Med.* 22(10): 1295-305.
- Bahreman M, Rai A, Alikhani M, Mohammadi S, Shahebrahimi K, Janjani P (2014). Relationship between family functioning and mental health considering the mediating role of resiliency in type 2 diabetes mellitus patients. *Glob. J. Health Sci.* 7(3): 254–59.
- Barnes H, Olson DH (1986). Parent-adolescent communication scale. In: Olson DH, McCubbin HI, Barnes H, Larsen A, Muxen M, Wilson M (Eds.). *Family Inventories*. St. Paul, MN: Family Social Science, University of Minnesota.
- Batty KE, Fain JA (2016). Factors affecting resilience in families of adults with diabetes. *Diabetes Educ.* 42(3): 291-98.
- DiMatteo MR(2004). Social support and patient adherence to medical treatment: a meta-analysis. *Health Psychol.* 23(2): 207-18.
- Fatusi AJ, Agboola SM, Shabi OM, Bello IS, Elegbede OT, Fatusi BB (2016). Relationship between family support and quality of life of type 2 diabetes mellitus patients attending family medicine clinic, federal medical centre, Ido-Ekiti. *Nig. J. Fam. Pract.* 7(2): 3-11.
- García-Huidobro D, Puschel K, Soto G (2012). Family functioning style and health: opportunities for health prevention in primary care. *Br. J. Gen. Pract.* 62(596): 198–203.
- Ghamari M, Khoshnam AH (2011). The relationship of original family functioning and quality of life among students. *J. Fam. Res.* 7(3): 343–54.
- George LK (2016). The health-promoting effects of social bonds. Department of Sociology, Center for the Study of Aging and Human Development. Duke University, Durham, NC. (Unpublished paper). Available at: <https://pdfs.semanticscholar.org/> [Last accessed on 2016, August 10].
- Haddadi P, Basharat MA (2010). Resiliency, vulnerability and mental health. *Procedia Social Behav. Sci.* 5(2010): 639-642.
- He M, Zhang Y, Zhao X (2014), Wang J. Family functioning in Chinese type 2 diabetic patients with and without depressive symptoms: a cross-sectional study. *Psychopathology* 47(1): 39-44.
- John ME, Effiong MU, Essien OE (2005). Compliance and glycemic control in adult diabetic patients in rural Nigeria. *Diab. Int.* 13: 17-20.
- Jones RA, Utz SW, Williams IC, Hinton I, Alexander G, Moore C, Blankenship J, Steeves R, Oliver N (2008). Family interactions among African Americans diagnosed with type 2 diabetes. *Diabetes Educ.* 34(2): 318–26.
- Mbanya JC, Gill GV (2004). Diabetes mellitus. In: Parry EPO, Godfrey R, Mabey D, Gill GV (eds). *Principles of medicine in Africa*. 3rd ed. Cambridge: Cambridge University Press.
- Najmi SB, Marasi MR, Hashemipour M, Hovsepian S, Ghasemi M (2013). The perceived self-efficacy and its interrelation with communication in family and glycemic control in adolescents with type 1 diabetes. *Pak. J. Med. Sci.* 29(1) Special Supplement IUMS: 334-39
- Ndubuka CH, Yohanna S, Obilom R (2016). Assessment of lifestyle modification measures and their effect on glycemic control in adult type 2 diabetes patients in Dalhatu Araf specialist hospital Lafia. *Nig. J. Fam. Pract.* 7(2): 13-20.
- Nozaki T, Morita C, Matsubayashi S, Ishido K, Yokoyama H, Kawai K, Matsumoto M, Takii M, Kubo C (2009). Relation between psychosocial variables and the glycemic control of patients with type 2 diabetes: a cross-sectional and prospective study. *Biopsychosoc. Med.* 3: 4.
- Ogera AO, Ekpebegh C (2014). Diabetes mellitus in Nigeria: the past, present and future. *World J. Diabetes* 5(6): 905-11.
- Olson DH (2011). FACES IV and the Circumplex Model: validation study. *J. Marital Fam. Therapy* 3(1): 64-80.
- Olson DH (2010). FACES IV Data Analysis Using FACES IV Scores. Available at: <http://www.facesiv.com> [Last accessed on 2012, June 3].
- Olson DH, Gorall DM (2003). Circumplex model of marital and family systems. In: Walsh F (Ed.). *Normal Family Processes: Growing Diversity and Complexity*. 3rd ed. New York: Guilford Press.
- Openshaw KP (2011). The relationship between family functioning, family resilience, and quality of life among vocational rehabilitation patients. A dissertation submitted in partial fulfillment of the requirements for the degree of Doctorate of Philosophy in Disability Disciplines (Rehabilitation Counseling). Utah State University Logan, Utah. Available at: <https://digitalcommons.usu.edu/> [Last accessed on 2016, August 10].
- Pereira GM, Berg-Crossa L, Almeida P, Machado CJ (2008). Impact of family environment and support on adherence, metabolic control, and quality of life in adolescents with diabetes. *Int J. Behav. Med.* 15: 187-93.
- Rosland AM, Heisler M, Choi HJ, Silveira MJ, Piette JD (2010). Family influences on self-management among functionally independent adults with diabetes or heart failure: do family members hinder as much as they help? *Chronic Illn.* 6(1): 22–33.
- Trief PM, Grant W, Elbert K, Weinstock RS (1998). Family environment, glycaemic control, and the psychosocial adaptation of adults with diabetes. *Diabetes care* 21(2):241-45.
- Unadike BC, Eregie A, Ohwovoriole AE (2010). Glycaemic control amongst persons with diabetes mellitus in Benin City. *Niger. Med. J.* 51(4): 164-66.
- Winek JL (2010). *Systemic family therapy: From theory to practice*. London. SAGE Publications, Inc.
- World Bank (2011). The growing danger of non-communicable diseases: acting now to reverse course (English). Washington DC: World Bank. Available at: <http://documents.worldbank.org/curated/en/19687146871468336643958/The-growing-danger-of-non-communicable-diseases-acting-now-to-reverse-course> [Last accessed on 2012, June 3].
- World Health Organization (WHO) (2011). *Non-communicable Diseases, Country Profiles 2011*. Geneva, Switzerland: WHO. Available at: https://www.who.int/publications/ncd_profiles2011/en/ [Last accessed 2012, June 3].

How to cite this article: Abdulsalam LB, Pitmang S, Sabir AS, Olatunji LK (2019). Relationship between family dynamics and glycemic control among adults with type 2 diabetes mellitus presenting at Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. *Int. Arch. Med. Med. Sci.* 1(3): 1-7.