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RESEARCH

The influence of family characteristics on glycaemic control among adult patients with type 2 diabetes mellitus attending the general outpatient clinic, National Hospital, Abuja, Nigeria

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Background: There is an increasing epidemic of diabetes worldwide with many patients not achieving set treatment targets. Family interventions in diabetes patient management, a proven adjunct, have not been fully integrated to patient care.
Method: A cross-sectional and descriptive study was conducted in the outpatient clinic of the Department of Family Medicine, National Hospital, Abuja. A total of 156 adult patients with type 2 diabetes were recruited between August and October 2012 with 145 (93%) completing the study. The Statistical Package for Social Sciences (SPSS) version 17.0 was used to enter and analyse the data.
Results: A total of 145 subjects (81 females, 64 males) were studied. Assessment of the relationship between the family characteristics and glycaemic control was significant for family functional status by APGAR (Adaptability, Partnership, Growth, Affection, and Resolve), which represents the questionnaire categories and social support by the Modified Scale for Perceived Social Support (MSPSS), p-value < 0.000.
Conclusion: There was a significant relationship between family function and social support and glycaemic control among type 2 diabetic patients attending the general outpatient clinic in the National Hospital, Abuja, Nigeria.

Keywords: family APGAR, family function, glycaemic control, social support, type 2 diabetes

Introduction

Background

The rates of diabetes mellitus are increasing worldwide. At least 171 million people currently have diabetes mellitus, and this figure is likely to more than double to 366 million by 2030.[1] At least 80% of people in Africa with diabetes are undiagnosed, and many in their thirties to sixties will die from diabetes.[2]

The increasing prevalence of diabetes in recent years in the developing countries is due to changing lifestyle, with adoption of Westernised diets.[3] Although there is a paucity of data on the prevalence of diabetes in Nigeria and other African countries, available data suggest that diabetes is emerging as a major health problem in Africa. A 2003 study put the prevalence of diabetes in Port Harcourt, a major urban city in Nigeria, at 6.9%[4] and a similar trend was found in a study in the south-western part of Nigeria.[5]

Self-care behaviour has been seen as an essential part in integrated programme to maintain good blood glucose control.[6] It has been found that addressing family relationships to provide needed support for self-care practices does improve outcome in chronic illnesses such as diabetes.[7] It was clearly stated in the diabetes education publication of the American Association of Diabetes Education in 2008 that four groups of factors probably account for most of the variability in self-care behaviour in patients with diabetes over time: characteristics of the patient, the patient's family, the practitioner and health system, and the community/work setting.[8] Of these four factors, characteristics of the patient's family, which is the primary social context of disease management, is the least explored.

In diabetes, interventions that include family members have been associated with improvement in metabolic control.[9] The family has been found to be a useful unit of intervention for glycaemic control when designing diabetic care strategies.[10] Recognising the important roles families play in management of chronic illnesses like diabetes, various family-based interventions are now being developed to improve metabolic control in primary care patients with uncontrolled type 2 diabetes, with very good results.[11]

Justification of the study

Earlier predictions of the global epidemic nature of type 2 diabetes during the early 2000s are being surpassed at an alarming rate, presently based on emerging epidemiological data from both developed and developing countries.[1] Achieving good glycaemic control among these increasing numbers of patients has become a global concern. Many patients can have difficulties following a DM treatment regime[12] and evidence suggests only about one-third of patients with type 2 diabetes achieve glycaemic targets.[13]

This calls for concerted efforts to increase the proportion of patients achieving good glycaemic control. It is thus imperative to explore the effects of family functioning in diabetes control. It was observed by White and colleagues[14] in a literature review that the role of family factors in adult diabetes intervention research has been neglected, particularly in type 2 diabetes.

An increasing number of diabetic patients have been observed in the Family Medicine department, National Hospital, Abuja and concern has been raised regarding the extent of physicians' exploration of factors and associations of family relationships in

optimisation of glycaemic control. The family dynamics and the impact of family functioning are not routinely assessed in diabetes management.

The primary aim of the study was to determine the influence of family characteristics in the optimisation of glycaemic control among adults with type 2 diabetes attending the general outpatient clinic, National Hospital, Abuja with a view to recommending family-based interventions.

Methodology

Study design

This was a descriptive and cross sectional study.

Study protocol

All eligible consenting adults presenting to the General Out Patient Department (GOPD) were recruited consecutively into the study until the maximum estimated sample size was attained. The study looked at all adults between the ages of 18 and 70 years with type 2 diabetes that met the inclusion criteria and were seen in the outpatient clinic of the National Hospital within the 3 months of the study (August to October 2012).

The study protocol involved the use of a pretested interviewer-administered questionnaire and validated data-collection instruments to collect data relating to the following: (1) family and social characteristics, (2) family APGAR, (3) Multidimensional Scale of Perceived Social Support (MSPSS), (4) socio-economic classification by Olusanya,[15] (5) physical examination, and (6) laboratory examination. Study subjects were interviewed alone, without a family member present, by trained research assistants. In this study, the MSPSS was adapted to test only the family support sub-scale in the tool. The variables in the family sub-scale formed part of the questionnaire. A total score of 12 to 17 was recorded as low acuity, 18 to 23 as moderate acuity and 24 to 28 as high acuity. An investigation record form was kept for every patient. The HBA1c results were classified as good control (HBA1c ≤ 7%) and poor control (HBA1c > 7%).[8]

Study population

In this study, the study (target) population was all type 2 diabetes patients that had been diagnosed and in care for a minimum of six months seen in the National Hospital, Abuja.

Inclusion and exclusion criteria

Patients aged between 18 and 70 years, diagnosis of type 2 diabetes for at least six months, no evidence of major diabetes complications (e.g. cerebrovascular accident, myocardial infarction, renal insufficiency, amputations) were included in the study. The exclusion criteria were gestational diabetes, < 6 months of DM diagnosis and type 1 diabetes.

Sampling technique

The sampling method used was purposive sampling. All consecutive type 2 diabetes patients meeting the inclusion criteria that were seen in the general outpatient clinic of the National Hospital, Abuja during the study period were enrolled by the researcher assisted by other members of the department till the maximum sample size of 156 was reached.

Sample size estimation

Since the population being studied was greater than 10 000, the sample size was thus calculated with Beneth's formula[16] using DM prevalence of 10.3% found in Jos, Plateau State Nigeria as 156 patients with a 10% attrition rate.

Data collection

Data were collected using a questionnaire (Appendix I) that was interviewer administered and a laboratory result form (Appendix II). The questionnaire was divided into sections seeking socio-demographic data, family APGAR and MSPSS.

Data analysis

The Statistical Package for Social Sciences™ (SPSS Inc., Chicago, IL, USA) version 17.0 was used to enter and analyse the data. Frequency and contingency tables were drawn to show the distribution of data within variables. A chi-square test of significance was used to test the association between the variables such as age categories, sex, marital status, socio-economic status etc. and glycaemic control. Significance was set at $p \leq 0.05$.

Ethical considerations

The research proposal was approved by the ethics committee of the National Hospital, Abuja, Nigeria. Written informed consent of all the subjects who were recruited into the study was obtained using a consent form designed for that purpose.

Results

A total of 156 adult patients with type 2 diabetes attending the general outpatient department of National Hospital Abuja were studied to determine the influence of family characteristics on their glycaemic control. A questionnaire was administered to each of the 156 patients, of which 145 (93%) who consented to the study had physical examinations done and blood samples

Table 1: Frequency distribution of family characteristics of the type 2 diabetes patients

Factor	Frequency (n = 145)	Percentage (%)
Type of family		
Monogamy	117	80.7
Polygamy	28	19.3
Employment status		
Employed	79	54.5
Retired	34	23.4
Unemployed	32	22.1
Socioeconomic class		
Upper class	58	40.0
Middle class	30	20.7
Lower class	57	39.3
No. of people living with patient		
> 7	29	21.4
6–7	16	11.0
3–5	59	40.9
0–2	39	26.5
APGAR class		
High family functioning	93	64
Moderately dysfunctional family	48	33
Severely dysfunctional family	4	2.8
MSPSS score	Frequency (n=145)	Percentage (%)
High acuity	84	57.9
Moderate acuity	51	35.2
Low acuity	10	6.9

Table 2: Frequency distribution of the level of diabetes control among the study population

Level of diabetes control	Frequency (n = 145)	Percentage (%)
Good glycaemic control	55	37.9
Poor diabetic control	90	62.1

collected and analysed for HbA1c level. The results obtained from these patients were then analysed.

Table 1 shows the distribution of the family characteristics of the study subjects. The age of the 145 subjects in the study ranged from 19 to 70 years (Table 3). The majority of the patients studied were within the 51-60 age group (36.6%) followed by the 61-70 age group (24.1%) and lowest number (5%) within the age group 21-30.

The family functional status of the 145 subjects was assessed using the family APGAR and it was found that 93 subjects (64%) belonged to highly functional families, 48 subjects (33%) to moderately dysfunctional families and 4 subjects (2.8%) belonged to severely dysfunctional families. The family sub-scale of MSPSS scores of the 145 subjects was assessed. Eighty-four (57.9%) subjects had high acuity, 51 (35.2%) moderate acuity and 10 (6.9%) low acuity (see Table 1).

Study of the level of diabetic control among the subjects showed that a greater number had poor diabetic control (90; 62.1%) and 55 (37.9%) had good diabetic control (Table 2). The results of diabetic control in relation to socio-demographic factors were also documented (Table 3). It was found that the relationship between educational status and glycaemic control was not statistically significant (p = 0.906), and neither was the type of family and glycaemic control (p = 0.494). The relationship between socio-economic status and glycaemic control was not statistically significant (p = 0.838).

Of the 93 subjects that had high family functioning, 55 (59.1%) had good glycaemic control and 38 (40.9%) had poor glycaemic control (Table 4). Forty-three (89.6%) subjects and 5 (10.4%) among those with moderate family dysfunction had good and poor glycaemic control respectively. Of the four subjects with severe family dysfunction, one (25%) had good glycaemic control and three (75%) had poor glycaemic control. The relationship between the APGAR class and glycaemic control was found to be statistically significant ($p \leq 0.001$).

Assessment of family support of subjects by the use of the modified MSPSS showed that the relationship between glycaemic

Table 3: The relationship between socio-demographics characteristics and type 2 diabetes control

Variables	HbA1c class		Total	Test statistic (χ^2)	p-value
	GC	PC			
Socio-demographics					
	n (%)	n (%)	n		
Age categories				0.608	0.737
21–40	12 (38.7)	19 (61.3)	31		
41–60	26 (35.1)	48 (68.9)	74		
> 60	17 (42.5)	23 (57.5)	40		
Sex				0.758	0.394
Female	34 (41.0)	49 (59.0)	83		
Male	21 (33.9)	41 (66.1)	62		
Marital status				2.043	0.153
Married	49 (40.5)	72 (59.5)	121		
Single	1 (16.7)	5 (83.3)	6		
Widow	3 (23.1)	10 (76.9)	13		
Widower	2 (40)	3 (60)	5		
Tribe				0.724	0.848
Ibo	23 (35.9)		41 (64.1)	64	
Yoruba	8 (44.4)		10 (55.6)	18	
Hausa	4 (30.8)		9 (69.2)	13	
Others	20 (40.0)		30 (60.0)	50	
Religion				0.004	0.951
Muslim	10 (38.5)		16 (61.5)	26	
Christian	45 (37.8)		74 (62.2)	119	
Educational status				0.557	0.906
No formal education	3 (42.9)		4 (57.1)	7	
Primary/Koranic	11 (34.4)		21 (62.2)	32	
Secondary	10 (43.5)		13 (56.5)	23	
University	31 (37.4)		52 (62.7)	83	

Table 4: Relationship between family characteristics and type 2 diabetes control

Variables	HbA1c class		Total	Test statistic (χ^2)	*p*-value
	GC	PC			
Family characteristics					
Type of family					
Mono	46 (39.3)	71 (60.7)	117	0.494	0.482
Poly	9 (32.1)	19 (67.9)	28		
Employment status				1.860	0.395
Employed	29 (36.7)	50 (63.3)	79		
Retired	16 (47.1)	18 (52.9)	34		
Unemployed	10 (31.3)	22 (68.8)	32		
Socioeconomic class				0.353	0.838
Upper class	23 (65.7)	35 (34.2)	57		
Middle class	10 (33.3)	20 (66.7)	30		
Lower class	22 (37.9)	35 (62.1)	58		
No. of people living with you					
> 7	12 (37.5)	20 (62.5)	32	0.657	
6–7	7 (38.9)	11 (61.1)	18		
3–5	25 (65.8)	31 (34.2)	38		
0–2	11 (28.2)	28 (71.8)	39		
APGAR class				31.331	<0.001
High family functioning	55 (59.1)	38 (40.9)	93		
Moderate dysfunctional family	5 (10.4)	43 (89.6)	48		
Severe dysfunctional family	1 (25)	3 (75)	4		
MSPSS score				41.956	<0.001
High acuity	62 (73.8)	22 (26.2)	84		
Moderate acuity	9 (17.6)	42 (82.4)	51		
Low acuity	3 (30)	7 (70)	10		

control and MSPSS score of the subjects was statically significant ($p \leq 0.001$) (Table 4).

Discussion

The diabetes burden is on the increase worldwide with the greatest relative increases expected to occur in the Middle East crescent, sub-Saharan Africa and India.[17] About 170 million men and women, who will reside in developing regions of the world in less than 30 years from now, will be suffering from diabetes in their reproductive years of life.[18]

This study revealed a direct relationship between family function and social support amongst other key family characteristics and glycaemic control in a sample of type 2 diabetic patients attending the general outpatient department. A total of 156 subjects were recruited into the study with an attrition rate of 7%, showing impressive participation.

The age range of the subjects was 19 to 70 years (mean 50 years, STDV 11.7). The greatest number of diabetics were found in the age range of 51–60 years and the least within the 21–30 age category. The finding is similar to other Nigerian studies, which showed the highest prevalence in the 46–60 age group.[4,19]

Gender and age are globally identified risk factors for diabetes mellitus.[20] A greater number of the diabetic subjects studied (57.2%) were females. This was similar to the finding in the Nigeria Diabetic Care study[35] but differed from the findings of other Nigerian studies that showed a male preponderance.[21,22]

Of the 145 study subjects, 121 (83.4%) were married, 13 (8.9%) were widows, 5 (3.4%) were widowers and 6 (4.1%) single subjects. This is similar to other studies, which showed a higher prevalence of diabetes among married subjects.[23] This can be explained by the increasing diabetes prevalence with age[24] as younger age groups comprised mainly single subjects.

Health inequalities in the prevalence of type 2 diabetes have been demonstrated. Research has shown that the socio-economic gradient for many diseases such as coronary heart disease and type 2 diabetes persists after control of confounders.[25,26] Type 2 diabetes affects all socio-economic groups but is generally more frequent in lower socio-economic groups in the developed countries[27,28] and the reverse in developing countries.[29,30] The upper and middle class constituted 67% of the study subjects. The higher prevalence of diabetes among the higher socio-economic class in the developing countries could be as a result of 'Westernisation' of lifestyle among this group with improvements in economic well-being.

The association between socio-economic status and type 2 diabetes is well known[31,32] but very little is known about the intermediate factors of this relationship, such as the educational status of these patients. In this study the greatest numbers of

subjects with type 2 diabetes were found among those with highest educational level. This is contrary to the finding in the EPIC-InterAct study[33] of European subjects, which showed an inverse relationship between educational level and risk of type 2 diabetes mellitus. The reason for this is related to the converse relationship noted earlier between type 2 diabetes prevalence and socio-economic status in developed and developing countries.

This study revealed a poor level of glycaemic control among study subjects with an average HBA1c of 8% (4.8–14%). Available studies on the outcomes of diabetes care in hospital-based cohorts are limited by the lack of information on HbA1c levels, which is the currently established best surrogate marker of diabetes control. For instance, in the Diabcare Africa study,[34] within the 12 months prior to data collection only about 47% of the participants had at least one measurement of HbA1c. This figure ranged from 27.5% in East African countries to 81.1% in Central African countries.

In the Diabetic Care Nigeria study, a multi-centre study that involved seven tertiary hospitals across the six geopolitical zones in the country, the mean HbA1c value assessed during the study was 8.3% ± 2.2%,[35] which was similar to what was found in this study and some other local studies.[36,37]

The reasons for poor glycaemic control found among the study subjects are multi-factorial. Poor compliance and adherence with follow-up visits and medications could have accounted for the poor level of glycaemic control among the study subjects. Financial constraints are also a key factor as most patients have to pay out of pocket for their drugs and for blood glucose tests, and at a price which has been found to be much higher than the cost of these drugs in other parts of the world.[38] In Nigeria, a substantial portion of health care costs (74.5%) is borne by the patient, as the government provides only about 25.5% of health care expenditure (according to a WHO report).[39] The WHO report estimates that 90.2% of Nigerians live below the poverty level of $2 per day. Thus, accessing health care is a challenge for people living with diabetes in Nigeria.[40] This difficulty is evident in reports showing a high prevalence of complications and mortality due to diabetes in Nigeria.[41]

Assessing the relationship between marital status and diabetes control showed no association ($p = 0.153$). This is similar to findings from other studies,[42,43] though findings from the National Health and Nutrition Examination Survey, United States, 2007–2010 did show that unmarried persons were more likely than married persons to have poor glycaemic control.[44]

The relationship between socio-economic status and diabetes was found not to be statistically significant in this study ($p = 0.737$). Low socio-economic status has been consistently linked to worse health outcomes and individuals living in low-income areas have higher rates of mortality and morbidity related to chronic diseases while the poorest of the poor around the world have been known to have the worst health.[45,46] This was not supported by findings from this study, though a local study[47] demonstrated a strong influence of low income and lower educational levels on poor diabetes outcomes as evidenced by ignorance and lack of relevant knowledge or skills required to maintain quality diabetes care and control.

Family function is defined as a state of family homeostasis in which member interaction results in emotional and physical nurture, thus promoting growth of family members and the family unit.[48] Assessment of the family functional status of survey participants using the family APGAR questionnaire and family support using the modified MPSS score showed a statistically significant relationship between family functioning and glycaemic control ($p < 0.001$) and MPSS score and glycaemic control ($p < 0.001$). This agrees with findings from other studies which have shown that glycaemic control is related to family functioning.[49,50]

This finding could be explained by the central role a family plays in patient management, especially in chronic illness like diabetes in our environment. This role in some situations can engender a positive outcome and in some may have a negative effect. A patient in a dysfunctional relationship will not be expected to benefit much from such a family in his/her disease management. It stands to reason therefore that physicians managing patients, especially those with chronic illnesses like type 2 diabetes, need to explore the family support available to such patients as well as the family functional status in others to tap into these proven resources effectively in patient care.

Given the significance of the reciprocal relationship between family function and glycaemic control as found in this study, it seems plausible to expect that improvement in family function and introduction of proven family-based interventions in patient management would break the vicious circle by leading to improvement in glycaemic control of the diabetic subjects.

This is supported by the findings of 12 randomised, controlled studies comparing family-oriented intervention with patient-oriented intervention.[51] Approximately half of these studies showed significant improvements over time for those receiving family interventions or reported that there was also a statistically significant advantage of family intervention over patient intervention. Other studies[21,52] showed a significant decrease in HA1c level following certain psychosocial interventions in patients with type 2 diabetes.

The family functioning of the study subjects was assessed only once and other parameters that may be a marker of diabetic control such as micro-albuminuria estimation and ophthalmoscopic eye examination of patients for diabetic retinopathy were not done. These and the noted difficulty in obtaining exercise and dietary utilisation of subjects were key study limitations.

In the light of the results from this study, primary care physicians should always assess the family functional status of diabetes patients in care and focus on a family counselling approach for those patients found to have impaired family functioning. Special designed interventions that ensure family participation in patients care could prove to be an effective complement to the usual treatment plans for diabetics, i.e. lifestyle modification and medications. It is also recommended that it might be important, following from the findings from this study, to test the hypothesis that specific interventions aimed at improving family function will lead to an improvement in the level of control of diabetes beyond that brought about by diet, exercise and medications. To determine conclusively whether family dysfunction has any causal effect on the control of diabetes, it is recommended that a long-term prospective study of cohorts of diabetics with different levels of family functioning be conducted.

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References

1. Wild S, Roglic G, Green A, et al. Global prevalence of diabetes: estimates for the year 2000 and projections for 2030. Diabetes Care. 2004;27:1047–53.
2. Romesh K, George TG. Type 2 diabetes mellitus treatment and management [cited 2011 Jul 20]. Available from: http://emedicine.medscape.com/articles.
3. Federal Ministry of health Nigeria. Report of the expert committee on non-communicable disease. Final Report of a National Survey: Non-Communicable Disease in Nigeria; 1997.
4. Ebenezer AN, Osaretin JO, Anele EI, et al. Type 2 diabetes in adult Nigerians: a study of its prevalence and risk factors in Port Harcourt, Nigeria. Diabetes Res Clin Pract. 2003;62:177–85.
5. Oyegbade OO, Abioye-Kuteyi EA, Kolawole BA, et al. Screening for diabetes mellitus in a Nigerian family practice population. SA Fam Pract. 2007;49(8):15–15d.
6. Michael P, Jacqueline AP, Chen-Pin W, et al. Glucose control, self-care behaviours, and the presence of the chronic care model in primary care clinics. Diabetes Care. 2007;30:2849–54.
7. Fisher L, Weihs K. Can addressing family relationships improve outcomes in chronic disease? J Fam Pract. 2000;49:561–6.
8. American Association of Diabetes Educators. AADE7 self-care behaviours. Diabetes Educ. 2008;34:445–9.
9. Armour TA, Norris SL, Jack L Jr, et al. The effectiveness of family interventions in people with diabetes mellitus: a systematic review. Diabet Med. 2005;22:1295–305.
10. Carolyn E, Anne LW, Vijay NJ, et al. The role of active family nutritional support in Navajo's type 2 diabetes metabolic control. Diabetes Care. 2003 Oct;26(10):2829–34.
11. Diego G, Marcela B, Paulina B, et al. Family intervention to control type 2 diabetes: a control clinical trial. Fam Pract. 2011;28:4–11.
12. Gonder-Frederick LA, Cox DJ, Ritterband LM. Diabetes and behavioral medicine: the second decade. J Consult Clin Psychol. 2002;70(3):611–25.
13. Massi-Benedetti M. Changing targets in the treatment of type 2 diabetes. Curr Med Res Opin. 2006;22(sup2):S5–13.
14. White P, Smith SM, O'Dowd T. The role of the family in adult chronic illness: a review of the literature on type 2 diabetes. Irish J Psychol. 2005;26(1–2):9–15.
15. Olusanya O, Okpere E, Ezimkhai M. The importance of social class in voluntary fertility control in developing countries. West African J Med. 1985;4:205–6.
16. Oyejide CO. Health research methods for developing country scientists. 2nd ed.. Ife; 2000. vol. 2, p. 59–63.
17. Narayan KMV, Zhang P, Ramachandran A, et al. How should developing countries manage diabetes. CMAJ. 2006;17: 733–6.
18. Levitt NS. Diabetes in Africa: epidemiology, management, and health care challenges. Heart. 2008;41:376–82.
19. Ekpenyong CE, Akpan UP, Ibu JO, et al. Gender and age specific prevalence and associated risk factors of type 2 diabetes mellitus in Uyo metropolis, South Eastern Nigeria. Diabetologia Croatica. 2012 Mar;41(1):17.
20. International Diabetes Federation. Clinical guidelines task force global guideline for type 2 diabetes. 2012 [cited 2013 May 10]. Available from: http://www.idf.org/sites/default/files/IDF-Guideline-for-Type-2-Diabetes.pdf.
21. Chijioke A, Adamu AN, Makusidi AM. Mortality pattern among type 2 DM patients in Ilorin, Nigeria. JEMDSA. 2010;15:78–82.
22. Ajayi EA, Ajayi AO. Pattern and outcome of diabetic admissions at a federal medical center: a 5-year review. Annals Afr Med. 2009;8:271–5.
23. Adejoh SO. Family unit in the context of diabetes management among the Igala North Central Nigeria. J BSA Medsoc Group. [cited 2013 Aug 9]. Available from: http://www.medicalsociologyonline.org/resources/Vol6Iss3/MSo-6005_Family-unit-in-the-context.pdf.
24. Kumar, Abbas, Fausto. Pathological basis of disease. 7th ed.. Saunders Company; 2008. p. 1189–206.
25. De Vogli R, Marmot M. Should socioeconomic factors be considered as traditional risk factors for cardiovascular disease, as confounders, or as risk modifiers? Dialog Cardiovasc Med. 2008;13(2):103–10.
26. Agardh E, Allebeck P, Hallqvist J, et al. Type 2 diabetes incidence and socioeconomic position: a systematic review and meta-analysis. Int J Epidemiol. [cited 2001 Feb 19]; 1–15.
27. Connolly V, Unwin N, Sherriff P. Diabetes prevalence and socioeconomic status: a population based study showing increased prevalence of type 2 diabetes mellitus in deprived areas. J Epidemiol Community Health. 2000;54:173–7.
28. Evans JM, Newton RW, Ruta DA. Socio-economic status, obesity and prevalence of type 1 and type 2 diabetes mellitus. Diabet Med. 2000;17:478–80.
29. Nwafor A, Owhoj A. Prevalence of diabetes mellitus among Nigeria in Port Hacourt correlates with socio-economic status. J Appl Sci Environ Manage. 2001;5(1):75–7.
30. Connolly V, Unwin N, Sherriff P, et al. Diabetes prevalence and socioeconomic status: a population based study showing increased prevalence of type 2 diabetes mellitus in deprived areas. J Epidemiol Community Health. 2000;54:173–7.
31. Ofoegbu EN. Cardiac autonomic neuropathy in Nigerian type 2 diabetes mellitus patients. Glob J Med Sci. 2005;4:52–4.
32. Odenigbo CU, Oguejiofor OC. Pattern of medical admissions at the federal Medical Center, Asaba- a two year review. Niger J Gen Pract. 2009;12(4):395–7.
33. Sacerdote C, Ricceri F, Rolandsson O, et al. Lower educational level is a predictor of incident type 2 diabetes in European countries: the EPIC-interact study. Int J Epidemiol. 2012 Aug;41(4):1162–73.
34. Sobngwi E, Ndour-Mbaye M, Boateng KA, et al. Type 2 diabetes control and complications in specialised diabetes care centres of six sub-Saharan African countries: the diabcare Africa study. Diabetes Res Clin Pract. 2012;95:30–6.
35. Chinenye S, Uloko AE, Ogbera AO, et al. Profile of Nigerians with diabetes mellitus - diabcare Nigeria study group (2008): results of a multicenter study. India J Endocrinol. 2008;68(4):558–64.
36. Adebisi SA, Oghagbon EK, Akande TM, et al. Glycated haemoglobin and glycaemic control of diabetes in Ilorin. Nig J Clin Pract. 2012;1:87–91.
37. Chinenye S, Young EE. State of diabetes care in Nigeria: a review. Niger Health J. 2011;11: 101–9.
38. The diabetes declaration and strategy for Africa: a call to action and plan of action to prevent and control diabetes and related chronic disease. IDF Summary document; 2006 Nov. [cited 2013 Aug 9]. Available from: http://www.idf.org/webdata/docs/diabetes.
39. WHO. Diabetes action now booklet. Geneva: World Health Organization; 2004 [cited 2013 Aug 8]. p. 2012. Available from: http://www:who.int/diabetes/booklet.
40. Ofoegbu EN. Cardiac autonomic neuropathy in Nigerian type 2 diabetes mellitus patients. Glob J Med Sci. 2005;4:52–4.
41. Aguocha BU, Ukpabi JO, Onyeonoro UU, et al. Pattern of diabetic mortality in a tertiary health facility in south-eastern Nigeria. Afr J Diabet Med. May 2013;12(1):14–7.
42. Milkins GD, White More R, Mitchel J. Type 2 diabetes in urban and rural white women. Diabet Educ. 2009;35:293–301.
43. Alex N, Goudswaard RP, Peter Z, et al. Patients characteristics do not predict poor glycaemic control in type 2 diabetes patient treated in primary care. Eur J Epidemiol. 2004;19:541–5.
44. Ali MK, Kai MB, Giuseppina I, et al. Characteristics associated with poor glycaemic control among adults with self-reported diagnosed

diabetes—National Health and Nutrition Examination Survey, United States, 2007–2010. MMWR 2012 Jun 15;61(02):32–7.
45. MMWR. Social economic status of women with diabetes United States 2000. A CDC Weekly Report. 2002 [cited 2012 Oct 19]. Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5107a3.htm.
46. Brown AF, Ettner SL, Piette J, et al. Socioeconomic position and health among persons with diabetes mellitus: a conceptual framework and review of the literature. Epidemiol Rev. 2004;26:63–77.
47. Unadike BC, Ohwovoriole A, Eregie AE. Prevalence of hypertension amongst persons with diabetes mellitus in Benin City, Nigeria. Niger J Clin Pract. 2011 Jul–Sep;14(3):300–2.
48. Masser AA. Mechanism of family homeostasis. Compr Psychiatry. 2005;12:380–8.
49. Konen JC, Summerson JH, Dignan MB. Family function, stress, and locus of control. Relationships to glycemia in adults with diabetes mellitus. Arch Fam Med. 1993;2(4):393–402.
50. Whitehead AL, Dimmock M, Place M. Diabetes control and influence of family functioning. J Diabetes Res Clin Metab. 2013;2:16. Available from: http://dx.doi.org/10.7243/2050-0866-2-16.
51. Martire LM. The "relative" efficacy of involving family in psychosocial interventions for chronic illness: are there added benefits to patients and family members? Fam Syst Health. 2005;23:312–28.
52. Ismail K, Winkley K, Rabe-Hesketh S. Systematic review and meta-analysis of randomised controlled trials of psychological interventions to improve glycaemic control in patients with type 2 diabetes. Lancet. 2004;363(9421):1589–97.

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