

A Cross-Sectional Survey of Diabetic Disease Pattern and Preventive Care in Lahore Pakistan

Noreen Rahat Hashmi[†]

ABSTRACT

Diabetes Mellitus is a major epidemic in Pakistan with associated increased morbidity and mortality however diabetic care is less than optimal. Most of the diabetic's complications can be prevented by adequate preventive care strategies.

Objective

To assess diabetic disease pattern and preventive care practices of patients in Lahore Pakistan.

Methodology

Study design: Cross sectional survey using convenient sampling of 181 patients from two hospitals in Lahore Pakistan. A pretested close ended questionnaire was used to collect the data.

Inclusion/Exclusion criteria: Type 2 diabetics diagnosed at least a year ago. Patients on insulin pumps, children and pregnant women were excluded. Data was entered into SPSS version 20.0 and chi-square was used to check the associations. P value of ≤ 0.05 was considered as statistically significant.

Results

Majority of patients were in the age group 50-59 years, were females, had no formal education, and had family income of <20,000 rupees per month. Majority of respondents had diabetes for 2-5 past years and were on oral anti diabetic medication. Renal disease was cited as the most common diabetic complication. Majority of the patients were not seeing their physicians for diabetes management on regular basis and did not have their blood sugar, feet or eye examination regularly. Majority of the patients had no pneumonia or influenza vaccination, diabetes or nutrition counseling. Education and income were positively related with doctor visits for their diabetic care and its schedule.

Conclusions

Diabetic care management was sub optimal in our patients. Majority of patients were not visiting their physicians for their diabetic care regularly Education and income had a statistically significant positive relationship with scheduled visits to their physicians for their diabetic care. Strategies to improve the diabetic care including patient education as well as improving accessibility to health care resources should be implemented.

Keywords

Diabetes mellitus, Patients, Prevention, Diabetic complications

Diplomat American Board of Internal Medicine MCPS-HPE, Health Services Academy Islamabad, Pakistan

[†]Author for correspondence: Noreen Rahat Hashmi, PhD Public Health Scholar, Diplomat American Board of Internal Medicine MCPS-HPE, Health Services Academy Islamabad, Pakistan, Tel: +91-923233888810; e-mail: drnoreen2@gmail.com

Introduction

The number diabetics in the world has risen from 108 million in 1980 to 422 million in 2014. Diabetes was blamed to be responsible for an estimated 1.6 million deaths in 2015 [1]. In Pakistan diabetes prevalence was 9.8% in a population of almost 19 million [2]. Type 2 diabetes epidemic has become a major health issue in Pakistan. Several risk factors including obesity, lack of physical activity, unhealthy eating habits have contributed to this rising incidence of type 2 diabetes [3].

Diabetic complications can be prevented by adequate control of blood sugar, blood pressure, and lipids. However it has been seen that mere pharmacological intervention is usually not enough to achieve optimum treatment goals, and patients have to be educated regarding appropriate diet, physical activity and self-monitoring in addition to adherence to medications [4,5]. However the ability of the diabetics to follow through these recommendations can be a daunting task as diabetes is a multi-system disease requiring complex, expensive treatment and preventive care strategies [6]. Decisions about health care behaviors including doctor visits and following diabetic recommendations are made by patients based on various factors. These include intrinsic factors like knowledge, beliefs and their motivation to follow particular recommendations. The health model belief encompasses patient beliefs about the severity of their disease, complexity of the treatment and their trust in the effectiveness of the treatment's outcomes [7]. Other factors are external like the physical and psychosocial factors in the environment that can affect the health care decision making process [8]. Patient factors that can affect diabetes management also include socio economic, psychological and health care system factors [9]. Patients with low education, low perceived self-efficacy, low socioeconomic status, depression, anxiety, and eating disorders find it most challenging to adhere to the diabetic regimens. Social support was noted to be very important for adherence to the diabetic care recommendations [10,11].

The objective of this study diabetic disease pattern and preventive care practices of patients and recommend strategies for improvement.

Methodology

■ Study design

Cross sectional survey

■ Sampling method

Patients were recruited based on convenient sampling of patients attending the medical departments (both inpatient and out patients) in two hospitals in Lahore Pakistan. Total patients who agreed to participate were 181.

■ Data tool

A pretested close ended questionnaire to check patient disease pattern and their preventive diabetic care. Patient questionnaire: was adapted from Centers for Disease Control USA questionnaire [12]. Questionnaire was read out to the patients by the trained data collectors in Urdu. This study specifically focused on preventive care rather than the therapeutic care because it was felt that there may be quite variation in the treatment depending on the disease status and comorbidities. An initial pilot study was done on a sample of 10 patients who were not included in the study.

■ Study Population

Diagnosed type 2 diabetics for more than one year.

■ Inclusion criteria

1. Both genders
2. Age above 18 years

■ Exclusion criteria

1. Patients on insulin pumps
2. Pregnant women were excluded due to their differential diabetes management requirements.

Patients were given verbal information about the study and oral consent was obtained prior to administering the questionnaire. Their participation in the interview was anonymous and voluntary and was taken as consent to take part in the study. The author had no financial conflicts of interest in this study. Ethical approval was obtained from Health Services Academy Ethical Review Board.

■ Data entry and analysis

Data was entered into SPSS version 20.0. The data was presented as frequencies and percentages, pie chart and component bar chart were used to present categories of variables and chi-square was used to check the association of visits to doctors with family income and education. P value of ≤ 0.05 was considered as statistically significant.

Results

Among respondents 108 (59.7%) were females, and majority of respondents 120 (66.4%) were above age of 50 years with 53 (29.3%) above 60 years. There were only 8 (4.4%) of respondents with age below 30 years. Only 19 (10.5%) had college education and 116 (64.1%) had no formal education. Sixty two (34.3%) of the participants had family income of less than 20 thousand rupees and only 22 (12.2%) had above 50 thousands rupees family income. Only 65 (35.9%) were economically active with some kind of job or profession and 116 (64.1%) were unemployed (Table 1).

The duration of diabetes was 2-5 years in 62 (34.3%) of the respondents, and was almost uniformly distributed among four categories. There were 127 (70.2%) respondents who had positive family history of diabetes and 118 (65.2%) had history of diabetes related complication. Among those with complications, kidney diseases were

the most prevalent followed by brain, nerve, heart and eye diseases. Majority of the respondents were on oral medicine for their diabetic management, one fourth were on insulin and 19 (10.5%) were using lifestyle modifications for managing their diabetes (Table 2).

Among the respondents 50 (27.6%) were not visiting their doctors on a regular basis while same number of respondents were visiting their doctors only when they needed diabetic medications or when they were having some diabetes related problem. Fourteen (7.7%) of respondents were visiting their doctors at 3 months interval, 34 (18.8%) were visiting on monthly basis and 23 (12.7%) and 8 (4.4 %) on fortnightly and weekly basis respectively.

Forty four (24.3%) of the respondents never had blood glucose levels and eyes examinations, while 84 (46%) never examined their feet. Only 5 (2.8%) were vaccinated against influenza and 4 (2.2%) were against pneumonia, while a signifi-

Table 1: Demographics characteristics of respondents (n=181).

	Variables	n	%
Age	<19	2	1.1
	20-29	6	3.3
	30-39	22	12.2
	40-49	31	17.1
	50-59	67	37.1
	>60 yrs	53	29.3
Gender	Females	108	59.7
Education	No formal education	116	64.1
	Primary school	13	7.2
	Middle school	10	5.5
	Secondary school	17	9.4
	College	19	10.5
Family Income Rs per month. (thousands)	≤ 20	62	34.3
	21-30	46	25.4
	31-40	38	21.0
	41-50	13	7.2
	>50	22	12.2
Profession	Unemployed	116	64.1
	Daily wages labor	26	14.4
	Mechanic	12	6.6
	Teacher	16	8.8
	Doctor	3	1.7
	Engineer	1	0.6
	Shopkeeper	4	2.2
	Businessman	3	1.7

Table 2: Clinical Features of participants diabetes mellitus pattern.

		n	%
Diabetes Duration (years)	<2	39	21.7
	2-5	62	34.4
	6-9	37	20.6
	>10	42	23.4
Family history of diabetes		127	70.2
Diabetic complications history		118	65.2
Types of diabetic complications n=118 (a case may present more than one complications)	Brain Disease	40	33.9
	Kidney Disease	64	54.2
	Eye Disease	35	19.3
	Heart Disease	23	19.5
	Nerve Disease	39	33.1
Treatment regimens	None	17	9.4
	Lifestyle changes	19	10.5
	Oral anti-diabetics	78	43.1
	Insulin	49	27.1
	Oral medications plus insulin	18	9.9

cant majority 74 (40.9%) were unaware of these vaccines (Figures 1 and 2).

Large majority of respondents 120 (66.3%) were never counseled for diabetes management, most of them if counseled were getting advise on annual basis, while counseling on nutrition was given to 74 (40.9%) on each visit with but another significant majority 86 (47.5%) had never been counseled on this issue (Table 3).

The visits to doctors were found significantly associated with family income and education of respondents with p-values <0.001 and 0.044 respectively. The persons with family income more than 30 thousands and better educational status were visiting doctors more regularly (Table 4).

Discussion

Diabetic care is complicated and it has been recommended that active participation of patients is crucial as they are important partners along with their health care professionals in their diabetic care [13]. Three patients strategies have been noted to be important for improving diabetes management. The first strategy is to improve diabetes related knowledge and self-education among patients. Second strategy is making sure patients comply with adequate therapeutic modalities to manage blood sugar, blood pressure and blood lipids levels. The third strategy noted is making sure effective mechanisms for early detection and management of diabetic complications are being followed [14].

Our study looked at the diabetic disease pattern as well as preventive care among our respondents.

Majority of patients in our study in the age group 50-59 years, were females, had no formal education, were unemployed and had income of less than rupees 20,000 per month. Majority of them were type 2 diabetics and were on oral anti diabetic medications. Majority had diabetes for the past 2-5 years. almost seventy percent had diabetes related complications with renal disease being cited as the most common diabetes related complication. In another study done in Pakistan showed that majority (68.5%) of patients was above 40 years and prevalence among male was slightly higher 95.4% then females 86.7%. Among diabetics hypertension was noted in 63%, neuropathy in 41% and retinopathy in 32%, while nephropathy was seen in 31% of patients which is different from our study which noted renal disease as the most common complication [15]. In an another study done in Pakistan it was noted that contrary to our study majority of diabetics were males (64%), with mean age 52.7 +/- 10.2 years. The mean duration of diabetes was also longer than noted in our study (16.2 +/- 6.6 years) [16]. In our study diabetic preventive care was less than adequate. Majority of patients were not seeing their doctors for their diabetic care on a regular basis. Majority of them did not check their blood sugars level regularly. Majority of them also did not have feet examination, eye examination, counseling sessions about diabetic management or required vaccinations as recommended. This data is similar form studies from various countries that have shown that there is a lack of achievement of recommended diabetic care in patients. Data from National Health and Nutrition Examination survey



Figure 1: Frequency of blood sugar, eye and feet examination among respondents.

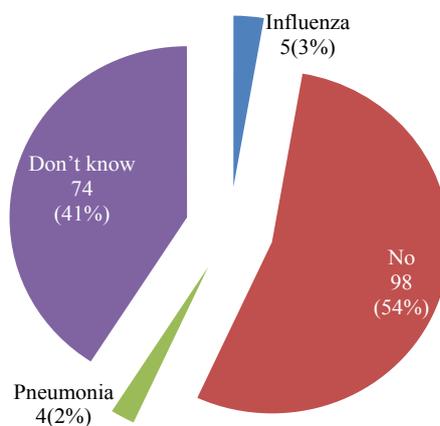


Figure 2: Frequency of Influenza and Pneumonia vaccination among the respondents.

Table 3: Counseling frequency for Nutritional and diabetes management by physicians.

Frequency	Nutrition Counseling		Diabetes management counseling	
	n	%	n	%
Never	86	47.5	120	66.3
Every time	74	40.9	9	5.0
3 monthly	4	2.2	1	0.5
6 monthly	13	7.2	21	11.6
Yearly	4	2.2	29	16
Total	181	100	181	100

Table 4: Frequency of doctor visits in relation to educational status and family income.

		Frequency of doctor visits for diabetes care							
		Never		On some schedule		As needed		Total	
		n	%	n	%	n	%	n	%
Family Income (rupees per month)	<30000	39	36.1	49	45.4	20	18.5	108	100.0
	>30000	5	6.8	48	65.8	20	27.4	73	100.0
		Chi Square 20.27 p<0.001							
Education	No education	36	31.0	57	49.1	23	19.8	116	100.0
	Basic education	6	15.0	22	55.0	12	30.0	40	100.0
	Higher education	2	8.0	18	72.0	5	20.0	25	100.0
		Chi Square 9.80 p=0.044							
No education: No formal schooling; Basic education: Primary education up to college education; Higher education: College education and professional degrees.									

USA from 1993-2010 showed that only 18% of patients of diabetics above age fifty years had achieved all of the three recommended diabetes management goals of blood sugar, blood pressure and lipid control [17,18]. Similarly a study done in Israel revealed that only 13% of the diabetics had achieved all of the above three goals for recommended diabetes management targets [19].

A retrospective study done in Karachi Pakistan among diabetics revealed that only 44% patients had examination of their lower legs and only 30 % had eye examination. Blood pressure was recorded in 85%, fasting blood sugar was noted in 50%, random blood sugar in 77% and HbA1c levels was recorded in 44% of the patients. In 46% of patients serum cholesterol was recorded [20]. Another study done in Azad Kashmir Pakistan in 2012-2013 revealed that 39% of patients had not received information about life style management and 68% had not been informed about diabetic complications regularly, even though more than half the patients claimed to have visited their doctors at least once a month in the past one year [21]. Contrary to our study another cross sectional survey done in Australia reported that about 66% of patients said that they had their eye examinations, lipid level checks and HbA1c tests regularly. The other recommended diabetic indicators were even better and almost all the respondents in that survey said that their blood pressure had been checked, 70% had creatinine examination done, and 42% had the recommended feet examinations. However lifestyle management recommendations like physical assessment, medication and self-management review were reported by less than 20% of respondents [22].

Patient’s knowledge, beliefs and attitude will contribute to the patient’s ability to follow the diabetic care recommendations. Lack of

knowledge of diabetes and its complications was noted in 75% of diabetics in India [23]. In a study done in Turkey only 14.5% of the patients were aware of problems related to high blood sugar and were able to self- monitor their blood sugars [24]. In Saudi Arabia diabetes knowledge among diabetics was 67.4% however only 50% of the patients were aware of diabetic complications [25]. In a study done in Islamabad Pakistan it was observed that knowledge about diabetes including awareness of complications of diabetes was noted in only 35%of respondents [26]. In another study done in Karachi only 10.7% had good blood sugar control and patient’s knowledge about diet and insulin was unsatisfactory [27]. In addition to knowledge about diabetes, patient’s social culture background, beliefs and their co-morbidities will affect both patient’s health literacy and their ability to manage their diabetes mellitus. Patient lack of motivation is also a barrier to adoption of prevention strategies [28]. Motivated patients have been noted to have the knowledge, confidence and skills to follow though diabetic preventive care recommendations [29].

Adequate financial resources is also an important factor that affects patient’s ability to achieve adequate diabetic preventive care [30]. In our study majority of the patients had family income of less than 20,000 rupees per month which may also may have affected their ability to follow diabetic recommended care. In Pakistan the out of pocket health expenditure contributes 76% of the total health expenditure [31]. The average direct cost for diabetes care in a survey done in Karachi Pakistan in 2014 was noted to be 5542 rupees (Rs) per month. The individual patient was spending on a average Rs. 700 per visit for consultation, Rs. 400 for each lab test, Rs. 1000/ month for blood sugar monitoring at home, Rs. 1100/month for medications and Rs. 200 for travel cost per visit [32].

Another factor which is important is most of the patients in our study were not visiting their doctors on a regular basis and therefore it is hard to discern if their physicians were guiding their patients about their diabetic care or that the patients were just being noncompliant with their physicians' recommendations. Our study was conducted in two government funded Public hospitals. Under-utilization of health services in public sector has been noted all over the developing countries [33]. Pakistan National Health Survey has shown similar trends in Pakistan as well and it has been noted that government doctors only provide 21% of the total health care [33]. In another survey it was noted that Pakistani patients over five years age had visited their health care providers about only five times per year [33]. Cross tab analysis showed that education and income were significantly related to patients visiting their physicians on schedule. Differential health care utilization pattern among diabetics have been also noted in other studies using income and education as proxy indicators of socioeconomic status [34]. In addition to financial barriers, lack of access to health care also has been noted to influence diabetic's health care behaviors [35].

Diabetic preventive care should be a part of routine care provided by health care professionals [36], however it has been seen that prevention was lacking in the health care service [37-39]. Some professionals also are not convinced about the effectiveness of preventative care [28]. It has been noted that primary prevention of type 2 diabetes requires not only that the health care practitioners are motivated but they must have adequate resources as well to carry out preventive strategies [39]. In other studies it has been seen that physician's increased work load, time constraints, inadequate training, and lack of resources can affect their ability to take care of their diabetic patients adequately [40]. Physicians have also cited patient's refusal to follow the interventions as a constraint for successful implementation of the diabetic recommendations [41]. Studies have noted a lack of understanding of cultural and religious constraints as well as problems of access to health care can cause a resistance of patients to follow the recommendations [42].

Limitations

Our study was conducted in urban hospitals and does not permit generalization of the results. Self-reporting may also overestimate the actual adherence to the preventive care. Our study was a pilot study and future studies will be needed for in depth analysis.

Future Recommendations

It is important to further look for the reasons behind this less than optimal diabetic preventive care among our respondents. Future studies should explore qualitative in-depth analysis of knowledge, attitude and motivation among patients to follow diabetic preventive care, other determinants of patient compliance including health care provider factors and various socioeconomic factors. Strategies to improve the diabetic preventive care including patient education as well cost effective strategies which patients can follow given their financial and contextual constraints is important. Patients should receive proper guidance about diabetes care based on their level of understanding these might include traditional methods like pictorial charts, role plays televisions well as novel methods like using mobile phones, social media for information dissemination. Training of physicians to guide patients to follow the preventive care guidelines is important to improve diabetes management. Planning and delivering preventive services needs collaborative efforts by academicians, policy makers, patients and health care professionals.

Conclusion

Diabetic preventive care was suboptimal in our patients. Majority of patients were not visiting their physicians regularly for their diabetic care. Education and income had a statistically significant positive relationship with regular visits with their physicians Acknowledgement: We are thankful to all the patients who participated in the survey.

Competing Interests

The Authors declared no competing interest by all the authors.

References

1. WHO Diabetes Fact sheet updated November (2017).
2. WHO Diabetes country profile (2017).
3. Ansari RM, Dixon JB, Coles J. Type 2 diabetes: Challenges to health care system of Pakistan. *Int. J. Diabetes. Res* 4(1), 7-12 (2015).
4. Gæde P, Lund-Andersen H, Parving HH, et al. Effect of a multifactorial intervention on mortality in type 2 diabetes. *N. Eng. J. Med* 358(6), 580-591 (2008).
5. Boussageon R, Bejan-Angoulvant T, Saadatian-Elahi M, et al. Effect of intensive glucose lowering treatment on all-cause mortality, cardiovascular death, and microvascular events in type 2 diabetes: meta-analysis of randomised controlled trials. *BMJ* 343(1), d4169 (2011).
6. Marrero DG. Changing patient behavior. *Endocr. Prac* 12(S1), 118-120 (2006).
7. Funnell MM. The diabetes attitudes, wishes, and needs (DAWN) study. *Clinical. Diabetes* 24(4), 154-155 (2006).
8. Punnett L, Cherniack M, Henning R, et al. A conceptual framework for integrating workplace health promotion and occupational ergonomics programs. *Pub. Health. Rep* 124(4), 16-25 (2009).
9. Delamater AM. Improving patient adherence. *Clinical. Diabetes* 24(2), 71-7 (2006).
10. Delamater AM, Jacobson AM, Anderson B, et al. Psychosocial therapies in diabetes. *Diabetes. Care* 24(7), 1286-1292 (2001).
11. Peyrot M, McMurry Jr JF, Kruger DF. A biopsychosocial model of glycemic control in diabetes: stress, coping and regimen adherence. *J. health. Social. Beh* 1(1), 141-148 (1999).
12. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveillance System Survey Questionnaire. U.S. Department of Health and Human Services: Centers for Disease Control and Prevention. *MMWR* 46(43), 1023-1027 (2005).
13. Holman H, Lorig K. Patients as partners in managing chronic disease. *BMJ* 320, (2000).
14. Campbell M, Fitzpatrick R, Haines A, et al. Framework for design and evaluation of complex interventions to improve health. *British. Med. J* 32(1), 694-696(2000).
15. Sarfraz M, Sajid S, Ashraf MA. Prevalence and pattern of dyslipidemia in hyperglycemic patients and its associated factors among Pakistani population. *Saudi. J. Boil. Sci* 23(6), 761-766 (2016).
16. Ali SM, Fareed A, Humail SM, et al. The personal cost of diabetic foot disease in the developing world—a study from Pakistan. *Diabetic. Med* 25(10), 1231-1233 (2008).
17. Casagrande SS, Fradkin JE, Saydah SH, et al. The prevalence of meeting A1C, blood pressure, and LDL goals among people with diabetes, 1988–2010. *Diabetes. Care* 36(8), 2271-2279 (2013).
18. Grol R, Wensing M. What drives change? Barriers to and incentives for achieving evidence-based practice. *Med. J. Aus* 180(6), 557 (2004).
19. Elis A, Rosenmann L, Chodick G, et al. The association between glycemic, lipids and blood pressure control among Israeli diabetic patients. *QJM: An. Int. J. Med* 101(4), 275-280 (2008).
20. Muzaffar F, Fatima N, Fawwad A, et al. Adherence of healthcare professionals to American Diabetes Association 2004 guidelines for the care of patients with type 2 diabetes at peripheral diabetes clinics in Karachi, Pakistan. *Pak. J. Med. Sci* 29(2), 474 (2013).
21. Riaz AC, Khan AM, Mahmood A. Diabetics and their Diseases, What do they know? Assessing Knowledge Level among Diabetic Patients. *Med. Forum* 25(08), (2014).
22. Clancy DE, Cope DW, Magruder KM, et al. Evaluating concordance to American Diabetes Association standards of care for type 2 diabetes through group visits in an uninsured or inadequately insured patient population. *Diabetes. Care* 26(7), 2032-2036 (2003).
23. Muninarayana C, Balachandra G, Hiremath SG, et al. Prevalence and awareness regarding diabetes mellitus in rural Tamaka, Kolar. *Int. J. Diabetes. Dev. Count* 30(1), 18 (2010).
24. Arslantas D, Unsal A, Metintas S, et al. Knowledge of diabetic patients about diabetes at the primary stage in Eskisehir, Turkey. *Pak. J. Med. Sci* 24(2), 263 (2008).
25. Mohieldein AH, Alzohairy MA, Hasan M. Awareness of diabetes mellitus among Saudi non-diabetic population in Al-Qassim region, Saudi Arabia. *J. Diabetes. Endocri* 2(2), 14-19 (2011).
26. Ulvi OS, Chaudhary RY, Ali T, et al. Investigating the awareness level about diabetes mellitus and associated factors in Tarlai (rural Islamabad): JPMA. *J. Pak. Med. Ass* 59(11), 798-801 (2009).
27. Badruddin N, Basit A, Hydrie MZ, et al. Knowledge, attitude and practices of patients visiting a diabetes care unit. *Pak. J. Nut* 1(2), 99-102 (2002).
28. Messina J, Campbell S, Morris R, et al. A narrative systematic review of factors affecting diabetes prevention in primary care settings. *PloSOne* 12(5), e0177699 (2017).
29. Gorter KJ, Tuytel GJ, de Leeuw RR, et al. Opinions of patients with type 2 diabetes about responsibility, setting targets and willingness to take medication. A cross-sectional survey. *Pat. Edu. Couns* 84(1), 56-61 (2011).
30. Nam S, Chesla C, Stotts NA, et al. Barriers to diabetes management: patient and provider factors. *Diabetes. Res. Clinical. Pra* 93(1), 1-9 (2011).
31. World Health Organization. World Health Report 2006: Working together for health, Geneva (2006).
32. Hussain M, Naqvi SB, Khan MA, et al. Direct cost of treatment of diabetes mellitus type 2 in Pakistan. *Int. J. Pharm. Sci* 6(11), 261-264 (2014).
33. Pakistan Medical Research Council. Health profile of people of Pakistan: National Health Survey of Islamabad, Pakistan (1998).
34. Sortsø C, Lauridsen J, Emneus M, et al. Socioeconomic inequality of diabetes patients' health care utilization in Denmark. *Health Econo. Rev* 7(1), 21 (2017).
35. Snoek FJ. Breaking the barriers to optimal glycaemic control—what physicians need to know from patients' perspectives. *Int. J. Clinical. Prac. Supp* 34(129), 80-84. (2002).
36. Helmink JH, Kremers SP, van Boekel LC, et al. Factors determining the motivation of primary health care professionals to implement and continue the 'Beweegkuur' lifestyle intervention programme. *J. Eval. Clinical. Prac* 18(3), 682-688 (2012).
37. Grace C, Begum R, Subhani S, et al. Prevention of type 2 diabetes in British Bangladeshis: qualitative study of community, religious, and professional perspectives. *BMJ* 337(1), a1931 (2008).
38. Lu S, Harris MF. Prevention of diabetes and heart disease: Patient perceptions on risk, risk assessment and the role of their GP in preventive care. *Australian family Physi* 42(5), 328 (2013).
39. Williams R, Rapport F, Elwyn G, et al. The prevention of type 2 diabetes: general practitioner and practice nurse opinions. *Br. J. Gen. Pract* 54(504), 531-535 (2004).
40. Seidu S, Khunti K. Non-adherence to diabetes guidelines in primary care—The enemy of evidence-based practice. *Diabetes. Res. Clinical. Prac* 95(3), 301-2 (2012).
41. Pérez CM, Febo-Vázquez I, Guzmán M, et al. Are adults diagnosed with diabetes achieving the American Diabetes Association clinical practice recommendations?. *Puerto. Rico. Health. Sci. J* 31(1), 18 (2012).
42. Johnson M, Everson-Hock E, Jones R, et al. What are the barriers to primary prevention of type 2 diabetes in black and minority ethnic groups in the UK? A qualitative evidence synthesis. *Diabetes. Res. Clinical. Prac* (2011)