# Self-Efficacy, Self-Care Activities Management and Treatment Outcome among Type 2 Diabetes Saudi Patients: Across-Sectional Study

Abubaker Ibrahim Elbur[1,*], Abdullah Salem AlMalki[2] and Sultan Abdullah Alharthi[3]

[1]*Clinical Pharmacy Department, College of Pharmacy, Taif University, Saudi Arabia*

[2]*Head of Endocrine Unit King Faisal Medical Complex, Taif, Saudi Arabia*

[3]*Pharmacy Director, King Faisal Medical Complex, Taif, Saudi Arabia*

**Abstract:** The main aims of this study were to measure the level of diabetes management self-efficacy and adherence to self-care activities management and to identify the influence of self- efficacy on management of self-care activities and the outcome of treatment among type 2 diabetic patients. A cross-sectional study was conducted at the Diabetes Clinic; King Faisal Medical Complex during the period of June –August 2016. Patients aged >20 years and diagnosed with type 2 diabetes for at least one year. Data was collected through face-to-face interview method using a pretested and validated questionnaire. Data was processed by the software SPPS (21.0 SPSS Inc., Chicago IL, USA). *P* value <0.05 was considered statistically significant. A total of 300 patients were eligible. Slightly more than 50 % of them were females. Overall, 164 (54.7%) patients were classified as having high diabetes management self-efficacy. Living in the town (*P* = 0.006) and being married (*P*= 0.003) were found to be the significant predictors of high self-efficacy. There were significant associations between self-efficacy by domain and adherence to the specific self-care activity corresponding to that domain. Overall, 84 (28%) of the patients attained the target therapeutic goal for diabetes and the control was significantly more among females (33.6%) than males (22.3%), (*P*= 0.031).

The results of the study identified many gaps related to management self-efficacy of diabetes and adherence to self-care activities. Interventions targeting the patients and their families to improve this situation are urgently needed.

**Keywords:** Self-Efficacy, Self-Care Activities, Management, Treatment Outcome, Type 2 Diabetes.

## INTRODUCTION

Diabetes mellitus is one of the most common chronic diseases among adults. In the Middle East and North Africa (MENA) the prevalence rate is 9.7% and 36.8 million people living with diabetes [1]. The five top countries in MENA with high prevalence of diabetes among adult patients were Saudi Arabia, Kuwait, Bahrain, Qatar and United Arab Emirates [1]. There were 3.8 million cases of diabetes in Saudi Arabia in the year 2014 and deaths among adults due to diabetes was 25,527 cases [2]. The uncontrolled raise in the prevalence of the disease in the Middle East region is mainly attributed to genetic factors, obesity, sedentary life style and the fact that these countries experience rapid change towards urbanization [3]. Type 2 diabetes mellitus (T2DM) causes significant mortality and morbidity [4]. Diabetes associated with long-term micro -vascular and macro-vascular complications, and these adverse outcomes are associated with poor glycemic control [5]. Despite clinical evidence of the beneficial effect of glycemic control and the advances achieved in diabetes control

and treatment, the management of type 2 diabetes mellitus remains challenging. Multiple interrelated factors affect glycemic control, which can be summarized as patient related factors, disease related factors and treatment related ones [6]. Researchers around different parts of the world reported high prevalence of uncontrolled diabetes with multiple factors implicated in poor glycemic control. For example, researchers reported younger age, longer duration of diabetes, insulin therapy, and poor adherence to treatment plan as the most significant factors associated with poor control [7]. In addition, increased duration of diabetes, noncompliance with a healthy eating plan, negative attitude towards diabetes with increased barriers to adherence were identified as significant factors associated with poor glycemic control [8]. Important factors that may affect the outcome of diabetes treatment is patients' self-efficacy and patient self- care management of their disease. Self-care in diabetes is crucial and involve the possession of knowledge and awareness to cope with the disease in a social context [9]. There are seven essential self-care behaviors namely; adhering to healthy eating, being physically active, monitoring of blood sugar, adherence to medications, good problem –solving skills, healthy coping skills and risk-reduction behavior [10]. On the other hand, self-efficacy is related to the beliefs about

*Address correspondence to this author at the Clinical Pharmacy Department, College of Pharmacy, Taif University, KSA, Saudi Arabia; Tel: +966541399649; E-mail: bakarelbu@yahoo.co.uk

the person's capabilities to produce defined levels of performance that exercise influence over events that affect the life [11]. An association between self-efficacy and better adherence to self-care management at different domains was documented [12] and high self-efficacy was found to be an important determinant of current diabetes control [13, 14]. Among diabetic individuals self-efficacy was found to be most often associated with self-care and improved quality of life [15].

To the best of our knowledge, in Saudi Arabia no previous research that measure the influence of patients' self-efficacy on patients self-care management and correlate it to glycemic control. Therefore, this study main aims were to measure the level of diabetes management self-efficacy and adherence to self-care activities management and to identify the influence of self- efficacy on management of self-care activities and the outcome of treatment among type 2 diabetic patients.

## METHODOLOGY

A cross-sectional study was conducted at the Diabetes Clinic; King Faisal Medical Complex during the period of June –August 2016. The clinic services include; patients follow-up and provision of health education and it has a separate clinic for the management of patients with diabetic septic foot. The study included patients aged >20 years and diagnosed with T2DM at least one year before commencement of data collection. Exclusion criteria include: cognitive impairment, inability to communicate verbally, refusal to participate in the study, pregnant or lactating women and the presence of incapacitating disease that limit activity. The patients were well-informed with the objectives of the research and were asked to give verbal informed consent for participation. A Convenience method of sampling was adopted. The sample size was calculated, based on a sample frame of 1200 patients (the total number registered in the clinic) with the assumption that 50% of them with poor glycemic control at the level of significance 0.05 with a margin of error 5%. The data was collected through face-to-face interview method, while the clinical data was extracted from the medical records. A pre-tested and validated questionnaire composed of four sections was used for the purpose of data collection. The first part was designed to collect data on patients' sociodemographic and clinical characteristics. The second part was designed to collect data on diabetes management self- efficacy using the Diabetes Management Self-efficacy Scale (DMSES) [16].

DMSES is a previously validated, 20 –items scale that could be used to assess the extent to which a patient is confident that he or she can manage his/ her blood glucose level (3 items), foot care (1 item), medication (2 item) , diet (10 items), level of physical activity (3 items) and visiting doctor once a year for checkup (1item). Responses were rated using a scale ranging from 0 (can't do at all) to 10 (certain to do) with high score indicates high self-efficacy and vice versa. If the patient score equal or above the mean score of all patients he/she was considered with high self-efficacy and with low self-efficacy if the score was below this cutoff point. Likewise, high efficacy at nutrition, physical exercise and medication domains were defined as scores above the mean score of all participants and low self-efficacy as scores below these cutoff points. The third part included the Revised Summary of Diabetes Self-care Activities (SDSCA) [17]. SDSCA is a self-reported scale that measures the rate of practicing thirteen diabetes self-care activities distributed through six sub-scales of DM behaviors namely; diet, exercise, blood glucose testing, medication taking, foot care and smoking behavior. The patient was requested to report the number of days in the last 7 days in which he/she performed each self-care activity. If the patient had suffered from any illness during the last 7 days, he/ she asked to report the performance of the 7 days before that period. Adherence to general diet, specific diet and physical exercise domains was defined as practicing the specified self-care activity for $\geq$ 5 during the past week, otherwise the patient was classified as non-adherent. Adherence to medication was defined as full commitment to the treatment plan in the previous seven days. Both DMSES and SDSCA were translated using forward-backward translation method [18]. Diabetes was considered controlled if Hemoglobin A1c (HbA1c) was < 7.0% and uncontrolled if HbA1c was $\geq$ 7.0% as per hospital protocol. A pilot study was conducted to test the questionnaire with a group of ten patients to ensure applicability and to estimate the time frame needed for data collection. Minor changes were suggested and adopted in the final version of the questionnaire.

## Data Analysis

Percentage and means were used to describe the variables. Logistic regression analysis was performed to determine the most significant independent variables (potential demographics and clinical variables) associated with diabetes management self-efficacy and diabetes control (dependent variables). Crude logistic regression analyses were performed as initial steps of

qualifying covariates to be included in multivariate logistic regression analyses. Covariates with *P* value <0.05 were eligible for inclusion in the final model. The Chi-square test was used to test the association between diabetes management self-efficacy by domain and self-care activity in the specified domain. P value <0.05 was considered statistically significant. Data was processed using the software SPPS (21.0 SPSS Inc., Chicago IL, USA).

### Ethical Approval

The study was approved by the Research and Ethical Committee, King Faisal Hospital, Taif, KSA.

### RESULTS

### Patients' Demographics

Overall, 300 patients were eligible. Slightly more than 50 % of them were females. The majority was living in the town and nearly 60% attained education below intermediate level. More than 60% of the interviewees admitted attendance of diabetes health education session/s. Table **1** showed the demographic data of the recruited patients.

### Diabetes Management Self-Efficacy

The internal consistency of diabetes management self-efficacy scale was found to be 0.902. The mean score for the scale was 128.5 $\pm$ 38.6. Overall, 164 (54.7%) patients were classified as having high diabetes management self-efficacy and the rest with low self-efficacy.

### Diabetes Management Self-Efficacy by Domains

Of all patients 154 (51.3%) were classified as having high self-efficacy to manage nutrition domain, 112(37.3%) exercise and weight control, 270 (90%) medication and 182 (60.7%) self- monitoring of blood glucose.

### Determinants of Diabetes Management Self-Efficacy

Table **2** showed the determinants of diabetes management self-efficacy. Iinitialy univariate analysis showed that residence in the town, attainment of intermediate educational level and above and marital status were significantly associated with high level of diabetes management self-efficacy. However, on multivariate analysis, only living in the town and being married were found to be the significant predictors of high self-efficacy.

**Table 1: Patients' Sociodemographic Data**

| Demographic | Frequency | Percent |
|---|---|---|
| **Gender** | | |
| Male | 148 | 49.3 |
| Female | 152 | 50.7 |
| **Age in years** | | |
| $\leq$60 Years | 208 | 69.3 |
| >60 Years | 092 | 30.7 |
| **Residence** | | |
| Town | 246 | 82.0 |
| Outside the town | 054 | 18.0 |
| **Educational level** | | |
| Intermediate & above | 124 | 41.3 |
| Below intermediate | 176 | 58.7 |
| **Marital status** | | |
| Married | 246 | 82.0 |
| Single | 054 | 18.0 |
| **Employment** | | |
| Employed | 059 | 19.7 |
| Unemployed | 241 | 80.3 |
| **Family Monthly income (SR)*** | | |
| < 5000 | 189 | 61.3 |
| $\geq$ 5000 | 116 | 38.7 |
| **Duration of diabetes** | | |
| 1-10 years | 161 | 53.7 |
| >10 years | 139 | 46.3 |
| **Attending formal diabetes education** | | |
| Yes | 191 | 63.7 |
| No | 109 | 36.3 |
| **Current treatment** | | |
| Oral hypoglycemic agent | 142 | 47.3 |
| Insulin | 073 | 24.3 |
| Both | 085 | 28.3 |
| **Total** | **300** | **100.0** |

### Diabetes Self-Care Activities

Table **3** showed the mean number of days for practicing diabetes self- care activities and the level of adherence to some of these activities. Mean number of days for adherence to diabetes treatment was found to be more than other activities. In addition, adherence to general diet was more than adherence to a specific diet.

### Association between Self-Efficacy and Adherence to Self-Care Activities by Domain

Table **4** showed the association between self-efficacy and adherence to self-care activities. The

**Table 2:   Determinants of Diabetes Management Self-Efficacy**

| Covariates | % High self-efficacy | N | Univariable analysis crude OR (95% CL) | P value | Multivariable analysis adjusted OR (95% CL) | P value |
|---|---|---|---|---|---|---|
| **Gender** | | | | | | |
| Male | 54.7 | 148 | 1.0 (0.6-1.6) | 0.983 | | |
| Female | 54.6 | 152 | | | | |
| **Age group in year** | | | | | | |
| ≤ 60 | 58.2 | 208 | 1.6 (1.0-2.6) | 0.067 | | |
| > 60 | 46.7 | 092 | | | | |
| **Residence** | | | | | | |
| Town | 58.1 | 246 | 2.2 (1.2-4.0) | 0.011 | 2.4 (1.3-4.4) | 0.006 |
| Outside town | 39.9 | 054 | | | | |
| **Educational level** | | | | | | |
| Intermediate & above | 62.9 | 124 | 1.8 (1.1- 2.8) | 0.017 | | |
| Below intermediate | 48.9 | 176 | | | | |
| **Marital status** | | | | | | |
| Married | 58.5 | 246 | 2.4 ( 1.3-4.4) | 0.005 | 2.6 (1.4-4.8) | 0.003 |
| Single | 37.0 | 054 | | | | |
| **Employment status** | | | | | | |
| Employed | 54.2 | 059 | 1.0 (0.6-1.7) | 0.941 | | |
| Non-employed | 54.8 | 241 | | | | |
| **Family monthly income (SR)** | | | | | | |
| < 5000 | 50.2 | 184 | 0.6 (0.4-1.0) | 0.071 | | |
| ≥ 5000 | 61.2 | 116 | | | | |
| Duration diabetes | | | | | | |
| 1-10 years | 55.3 | 161 | 1.1 (0.7-1.7) | 0.819 | | |
| >10 years | 54.0 | 139 | | | | |
| **Attending diabetes education** | | | | | | |
| Yes | 55.5 | 191 | 1.1 (0.7-1.8) | 0.702 | | |
| No | 53.2 | 109 | | | | |
| **Total** | | **300** | | | | |

**Table 3:   Mean Number of Days and Adherence to Diabetes Self-Care Activities**

| Diabetes self-care Activities | Mean number of Days/adherence ± SD | Adherent |
|---|---|---|
| General diet | 3.6 ± 2.6 | 115 (38.3%) |
| Specific diet | 3.8 ± 1.6 | 82 (27.3%) |
| Physical exercise | 1.9 ± 2.1 | 36 (12.0%) |
| Medication taking | 6.5 ± 1.5 | 265 (88.3) |
| Blood glucose testing | 2.1 ± 2.0 | |
| Foot exams | 3.5 ± 2.9 | |

results showed that there were significant associations between self-efficacy by domain and adherence to the specific self-care activity corresponding to that domain.

**Blood Glucose Control and its Predictors**

Overall, 84 (28%) of the patients attained the target therapeutic goal for diabetes. The results showed a significant gender difference in the control of the disease [females 33.6% vs. males 22.3%, (*P*= 0.031). However, no significant association was identified between self-efficacy for management of the disease and disease control [29.9% of the patients with high self-efficacy compared with 25.7% with low self-efficacy, (P= 0.427)].

**Table 4:    Diabetes Management Self-Efficacy and Self-Care Management Practices**

| Domain | Self-efficacy % | | Adherent | Odd ratio | 95% CI | P value |
|---|---|---|---|---|---|---|
| | High | Low | | | | |
| Nutrition-general diet | 57.8 | 17.8 | 115 | 0.2 | (0.1-0.3) | <0.001 |
| Nutrition- specific diet | 35.1 | 19.2 | 82 | 2.3 | (1.3-3.9) | 0.002 |
| Physical exercise | 21.4 | 6.4 | 36 | 0.3 | (0.1-0.5) | <0.001 |
| Medication taking | 89.6 | 76.7 | 265 | 2.6 | (1.0-6.7) | 0.042 |

## DISCUSSION

The current study attempted to explore the association between management self-efficacy and adherence to self-care management behaviors and to identify the influence of self- efficacy on the outcome of treatment among type 2 diabetic patients. The results showed that the mean score of DMSES averaged at 128.5 ± 38.6 which indicating a moderate level of self-efficacy. But, comparatively, it was higher than the average score reported by other Iranian researchers who conducted a recent study and reported overall mean score of 96.6±34.6 for the same scale [19]. Further analysis of the DMSES scale by domains revealed that, high proportion of the included participants had high efficacy to manage medication taking behavior and comparatively low proportion of them with high self-efficacy to manage diet and exercise activity. The same difference was observed in the level of adherence to medication compared to non-pharmacological lifestyle measure (diet and exercise). This finding showed that the majority of the patients had poor knowledge about the role of non-pharmacological therapy in blood glucose control and prevention of the complications related to the progressive nature of the disease. This was in agreement with the result of a study conducted in India, whereby the authors attributed this finding to poor knowledge about the disease, poor health literacy and advanced age [20]. A recent study also reported moderate compliance with self-care behaviors and again medication taking behavior was ranked as the top in adherence, compared to other self-care activities [21]. Despite the fact that a considerable number of the recruited patients in the current study admitted attending health education session/s on the disease provided by the clinic, but it seem the components of these sessions need to be revised with respect to the emphasis on the role of adherence to self-care activities. Multiple factors can influence patient adherence to dietary recommendations. The extended family and the type of social life in the country and increased trend in fast food in the country [22]. These

factors were reported by other researchers as determinant factors that limit non-adherence. In addition, to the lack of motivation and with respect to diet, some patients dislike the type of food that included in the dietary plan [23].

On the other hand, non-adherence to physical exercise was mainly attributed to the fact that nearly 50% of the participants were females and elderly patients constituted approximately 30% of the sample. In contrary Mumu *et al.* [24] found adherence to exercise higher than adherence to diet and barriers to non-adherence were the presence of co-existing disease/s and the patients did not have enough time to do exercise.

The results showed that high diabetes management self-efficacy was significantly associated with residence in the town. This finding should be further investigated to determine the factors that affect self- efficacy among rural residents. But, essence of accessing health care facilities and more contact with health care providers may explain this difference. In addition, in the town the resources for health information about the disease are many and can be easily accessible when compared to rural areas. The second predictor of high level of diabetes management self-efficacy was marital status as married patients had high level of self-efficacy compared to single ones. The influence of social support and high self-efficacy on practicing self-care activities and overall impact on glycemic control was documented in the literature [25].

Overall, 28% of the recruited patients achieved the target therapeutic range. In the eastern part of Saudi Arabia researchers found that, only one third of the patients were achieving their glycemic control target (fasting or random capillary blood glucose [26]. The authors of that study identified advanced age, being smoker and lower level of physical activity as determinants of uncontrolled diabetes. However, the current study identified a significant gender difference in the disease control, females more than males. Some authors encouraged healthcare providers to consider

the psychosocial, behavioral, and clinical differences beside variation in attitudes and behaviors toward self-care between men and women, which, ultimately have a direct effect on the outcomes of the disease [27].

The results showed that there was no significant association between diabetes management self-efficacy and the control of the disease. The factor that may justify the obtained result is related to the fact that some patients may exaggerate their capabilities for doing certain actions, but in reality they fail to do so. This raised a question on the sensitivity of the scale to the Saudi patients, which can be further investigated among large number of patients to be recruited from different health care facilities. In contrary to this finding, other researchers found a strong association between high self-efficacy and glycemic control [13, 14, 28].

The results of this study revealed important deficiencies related to the care provided to diabetic patients with regard to the quality of health education. The clinic is well-equipped with both clinical facilities and personnel who can provide health education. But, the components of health education should focus on motivating the patients to improve their self-efficacy to manage the disease. Recent research findings demonstrated valuable results of interventions targeted improvement of self-efficacy and self-care. For example, Wichit *et al.* [29], provided a family oriented intervention targeting both self-efficacy and self-care, the results of which showed that higher self-management scores significantly resulted in reduction of HbA1c levels and improved quality of life. In addition, concentrating on patients self-efficacy to influence self-care activities when family members are involved in the process of care was documented to yield better results, compared to pressure-based social approach among elderly diabetics [30]. One interesting recent randomized trial proved that when physicians trained in self-efficacy enhancing interviewing techniques this significantly resulted in improving psychological health behavior change mediators with more readiness to practice self-care activities [31].

This study had two limitations. Firstly, it was conducted in one clinic at one hospital in the country, which limit the generalizability of the results to all type 2 diabetic patients in the country. Secondly, the data on adherence to self-care activities and medication were collected through interview method, which subjected to bias in reporting the correct answers by some patients.

In conclusion, the results of the current study showed that the overall patients diabetes management self-efficacy and at different domains was moderate, with a significant association between self-efficacy and practicing self-care activities at diet, physical exercise and medication taking behavior. On the other hand, the level of disease control was low and there was a significant difference in the disease control between females and males and no association between self-efficacy and attainment of the therapeutic target.

## REFERENCES

[1]     International Diabetes Federation Middle East and North Africa. IDF diabetes atlas Sixth edition 2014. Available at http://www.idf.org/regions/mena/regional-data.      Accessed March 20, 2017.

[2]     International Diabetes Federation. [Online] https://www.idf. org/membership/mena/saudi-arabia. Last accessed 15 Feb 2017.

[3]     Abuyassin B, Laher I. Diabetes epidemic sweeping the Arab world. World J Diabetes 2016; 7(8): 165-174. https://doi.org/10.4239/wjd.v7.i8.165

[4]     Zimmet P, Alberti KG, Shaw J. Global and societal implications of the diabetes epidemic. Nature 2001; 414: 782-787. https://doi.org/10.1038/414782a

[5]     Gerstein HC, Pogue J, Mann JF, Lonn E, Dagenais GR, McQueen M, *et al.* The relationship between dysglycaemia and cardiovascular and renal risk in diabetic and non-diabetic participants in the HOPE study: a prospective epidemiological analysis. Diabetologia 2005; 48: 1749-1755. https://doi.org/10.1007/s00125-005-1858-4

[6]     Sana ITS, Nair NS Adhikari P. Factors associated with poor control of type 2 diabetes mellitus: A systematic review and Meta-analysis. Journal of Diabetology 2011; 3: 1.

[7]     Quah JH, Liu YP, Luo N, How CH, Tay EG. Younger adult type 2 diabetic patients have poorer glycaemic control: a cross-sectional study in a primary care setting in Singapore. BMC Endocr Disord 2013; 13: 18. https://doi.org/10.1186/1472-6823-13-18

[8]     Khattab M, Khader YS, Al-Khawaldeh A, Ajlouni K. Factors associated with poor glycemic control among patients with type 2 diabetes. J Diabetes Complications 2010; 24: 84-9. https://doi.org/10.1016/j.jdiacomp.2008.12.008

[9]     Paterson B, Thorne S. Developmental evolution of expertise in diabetes self- management. Clin Nurs Res 2000; 9: 402-419. https://doi.org/10.1177/10547730022158663

[10]    American Association of Diabetes Educators: AADE7 Self-Care Behaviors. Diabetes Educ 2008; 34: 445-449.

[11]    Bandura A. Self-Efficacy: The Exercise of Control. New York, Prentice-Hall 1994.

[12]    Al-Khawaldeh OA, Al-Hassan MA, Froelicher ES. Self-efficacy, self-management, and glycemic control in adults with type 2 diabetes mellitus. J Diabetes Complications 2012; 26(1): 10-6. https://doi.org/10.1016/j.jdiacomp.2011.11.002

[13]    Venkataraman K, Kannan AT, Kalra OP, Gambhir JK, Sharma AK, Sundaram KR, Mohan V. Diabetes self-efficacy strongly influences actual control of diabetes in patients attending a tertiary hospital in India. J Community Health 2012; 37(3): 653-62. https://doi.org/10.1007/s10900-011-9496-x

[14]    Wynn Nyunt S, Howteerakul N, Suwannapong N, Rajatanun T. Self-efficacy, self-care behaviors and glycemic control among type-2 diabetes patients attending two private clinics in Yangon, Myanmar. Southeast Asian J Trop Med Public Health 2010; 41(4): 943-51.

[15]    Walker RJ, Gebregziabher M, Martin-Harris B, Egede LE. Independent effects of socioeconomic and psychological social determinants of health on self-care and outcomes in Type 2 diabetes. Gen Hosp Psychiatry 2014; 36(6): 662-8. https://doi.org/10.1016/j.genhosppsych.2014.06.011

[16]    Van Der Bijl JJ, Van Poelgeest-Eeltink A, Shortridge-Baggett L. The psychometric properties of the diabetes management self-efficacy scale for patients with type 2 diabetes mellitus. Journal of Advanced Nursing 1999; 30: 352-359. https://doi.org/10.1046/j.1365-2648.1999.01077.x

[17]    Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: results from 7 studies and a revised scale.Diabetes Care 2000; 23: 943-50. https://doi.org/10.2337/diacare.23.7.943

[18]    WHO. Process of translation and adaptation of instruments [Online].    http://www.who.int/substance_abuse/research_tools/translation/en/. Last accessed 20 October 2015.

[19]    Reisi M, Mostafavi F, Javadzade H, Mahaki B, Tavassoli E, Sharifirad G. Impact of Health Literacy, Self-efficacy, and Outcome Expectations on Adherence to Self-care Behaviors in Iranians with Type 2 Diabetes. Oman Med J 2016; 31: 52-9. https://doi.org/10.5001/omj.2016.10

[20]    Chavan GM, Waghachavare VB, Gore AD, Chavan VM, Dhobale RV, Dhumale GB. Knowledge about diabetes and relationship between compliance to the management among the diabetic patients from Rural Area of Sangli District, Maharashtra, India. J Family Med Prim Care 2015; 4: 439-43. https://doi.org/10.4103/2249-4863.161349

[21]    Huang CH, Lin PC, Chang Yeh M, Lee PH. A Study on Self-Care Behaviors and Related Factors in Diabetes Patients. Hu Li Za Zhi 2017; 64: 61-69.

[22]    Naeem Z. Increasing trend of Junk food use in Saudi Arabia and health implications. Int J Health Sci (Qassim) 2012; 6: V-VI. https://doi.org/10.12816/0005967

[23]    Luis-Emilio García-Pérez, María Álvarez, Tatiana Dilla, Vicente Gil-Guillén, and Domingo Orozco-Beltrán. Adherence to therapies in Patients with type 2 Diabetes. Diabetes Ther 2013; 4: 175-194. https://doi.org/10.1007/s13300-013-0034-y

[24]    Mumu SJ, Saleh F, Ara F, Ali L. Non-Adherence to Lifestyle Modification and its Determinants among Bangladeshi type 2 Diabetic Patients. Int J Epidemiol 2015; 44(Suppl_1): i148-i149.

[25]    Gao J, Wang J, Zheng P, Haardörfer R, Kegler MC, Zhu Y, Fu H. Effects of self-care, self-efficacy, social support on glycemic control in adults with type 2 diabetes. BMC Fam Pract 2013; 14: 66. https://doi.org/10.1186/1471-2296-14-66

[26]    Al-Baghli NA, Al-Turki KA, Al-Ghamdi AJ, El-Zubaier AG, Al-Ameer MM, Al-Baghli FA. Control of diabetes mellitus in the Eastern Province of Saudi Arabia: results of screening campaign. East Mediterr Health J 2010; 16: 621-9.

[27]    Gucciardi E, Wang SC, DeMelo M, Amaral L, Stewart DE. Characteristics of men and women with diabetes: observations during patients' initial visit to a diabetes education centre. Can Fam Physician 2008; 54: 219-27.

[28]    Walker RJ, Smalls BL, Hernandez-Tejada MA, Campbell JA, Egede LE. Effect of diabetes self-efficacy on glycemic control, medication adherence, self-care behaviors, and quality of life in a predominantly low-income, minority population. Ethn Dis 2014; 24: 349-55.

[29]    Wichit N, Mnatzaganian G, Courtney M, Schulz P, Johnson M. Randomized controlled trial of a family-oriented self-management program to improve self-efficacy, glycemic control and quality of life among Thai individuals with Type 2 diabetes. Diabetes Res Clin Pract 2017; 123: 37-48. https://doi.org/10.1016/j.diabres.2016.11.013

[30]    Yang F, Pang JS, Cheng WJ. Self-Care Adherence and Psychological Functioning of Older Patients with Type 2 Diabetes: Effects of Persuasion, Social Pressure, and Self-Efficacy. J Clin Psychol Med Settings 2016; 23: 389-401. https://doi.org/10.1007/s10880-016-9470-y

[31]    Jerant A, Lichte M, Kravitz RL, Tancredi DJ, Magnan EM, Hudnut A, Franks P. Physician training in self-efficacy enhancing interviewing techniques (SEE IT): Effects on patient psychological health behavior change mediators. Patient Educ Couns 2016; (11): 1865-1872. https://doi.org/10.1016/j.pec.2016.07.002