

Oral Health Awareness in Type 2 Diabetes Patients: A Survey-Based Questionnaire Study from Lahore, Pakistan

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ABSTRACT

Background and Objective: Pakistan has the seventh highest prevalence of diabetes worldwide. Self-care practices play a substantial role in the management of type 2 diabetes and in avoiding associated complications. Socio-demographics and knowledge directly affect self-care practices among patients. This study was conducted to assess self-care practices and determine their association with sociodemographic factors among patients with type 2 diabetes in Lahore, Pakistan. In addition, oral health awareness was also assessed among the study participants.

Methods: A purposive sample of 402 patients with type 2 diabetes was selected for this analytical study. Face-to-face interviews were conducted using a structured questionnaire to collect the data. Information was collected regarding sociodemographic variables, clinical factors, oral health awareness, and self-care practices related to diabetes management. Descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated for continuous data. Categorical variables were analysed using the Chi-square test.

Results: None of the standardized self-care practices of diabetes were observed to be adhered by all patients. For example, only 29.90% of study participants reported checking their feet daily. Sociodemographic factors of gender, educational level, marital status, and income were associated with adherence to self-care practices among patients with diabetes. Patients were least aware (36.30%) of the need to have regular dental check-ups at least two times a year to ensure good oral health.

Conclusion: Self-care practices as well as the oral health care of patients with diabetes are affected by various sociodemographic indicators. Clinically, this information can be applied to design and target education and care planning amongst patients with type 2 diabetes. Providing special attention to patients with diabetes would allow for the provision of realistic recommendations regarding self-care.

KEYWORDS: Self-care practices, Oral health, Type 2 diabetes, Developing countries, Pakistan.

INTRODUCTION

Diabetes is a chronic disease that occurs when the pancreas does not produce sufficient insulin or when the body fails to effectively use the produced insulin.¹ There are two types of diabetes, as follows: type 1 diabetes refers to when there is deficient insulin production in the body, whereas type 2 diabetes results from the body's ineffective ability to use the insulin. Across the globe, more people suffer from type 2 than type 1 diabetes.¹

In 2014, the prevalence of diabetes globally was estimated to be nearly 8.5% among adults older than 18 years of age.² More than 400 million people suffer from diabetes and complications related to diabetes, resulting in nearly 1.5 million deaths each year.³ A major concern today is the rapidly increasing numbers

of people suffering from type 2 diabetes, which mainly affects people in China, India, and other low- and middle-income countries (LMICs).⁴

While being a LMIC, Pakistan is also ranked as the seventh highest-prevalence country for type 1 diabetes.⁵ However, there is no solitary prevalence rate available countrywide due to conflicting findings from different regions of the country, where prevalence rates range from 7.2% to 19.2%.⁶ However, high prevalence rates can be attributed to unhealthy lifestyle, family history of diabetes, maternal and foetal malnutrition, obesity and overweightness, genetic predisposition, physical inactivity, environmental pollution, un-healthy diet (i.e., consumption of high-fat and high-caloric food), and smoking.^{4,5,7,8}

The management of diabetes and its associated risk factors remains deplorable in Pakistan.^{7,8}

According to a report, in Pakistan, 9,180 female and 7,210 male deaths occurred among people aged 30 to 69 years, while 12,800 female and 9,560 male deaths occurred among those aged 70 years or older due to complications related to diabetes in 2016.⁹ As diabetes is incurable but controllable, if it is not managed well, it can lead to serious complications that not only compromise the quality of life but which can also prove to be life-threatening.¹⁰ Good self-care practices can help with avoiding many complications of diabetes.¹¹ Patient knowledge and socio-demographics (e.g., income, education, gender, marital status) affect the adoption of these self-care practices as well as disease outcomes among persons with diabetes.¹²⁻¹⁶ Clinical factors for self-care practices include adherence to medication, receipt of treatment tailored to specific diabetes type, regular participation in glycated haemoglobin-level testing, and receipt of follow-up care.¹⁷

The rapid increase in the prevalence of type 2 diabetes in Pakistan is alarming, and focus on treatment is crucial. Moreover, baseline data on self-care practices are also required to determine which specific areas of self-management as well as oral health are in need of greater focus among patients so that appropriate educational strategies maybe formulated. Diabetes is a serious illness for which the relationship between self-care and sociodemographic variables must be addressed. Therefore, this study was conducted to assess self-care practices and associated sociodemographic factors among patients with type 2 diabetes in Lahore, Pakistan and also explored the degree of oral health awareness among patients.

METHODS

The questionnaire used in this study was duly approved by the Ethical Review Committee (ERC) of the Hussain College of Health Sciences/Hussain Memorial Hospital, Lahore (Letter No. HCSC/19/ERC/106). Moreover, this study protocol adhered to international ethical guidelines for health-related research involving hu-mans.¹⁸

This analytical study was conducted for a period of seven months between June and December, 2018 at pharmacy, inpatient, outpatient, and emergency departments of Hussain Memorial Hospital in Lahore, Pakistan. Prior to interviews, patients were provided with information in the form of leaflets translated into the national language (i.e., Urdu) describing the purpose of the research, the ERC approval, and data confidentiality practices. All participants then provided written informed consent.

Patients visiting the hospital who were (1) aged 18 years or older; (2) having at least a three-year history of type 2 diabetes;¹⁹ and (3) able to provide informed consent were eligible to participate in the study. Patients who were not able to understand and speak

English, Urdu, or Punjabi were excluded from the study.

The minimum sample size needed to maintain a 5% margin of error and 95% confidence interval was calculated as 402 using the Raosoft sample size calculator. Using a purposive sampling technique, 402 patients who met the aforementioned inclusion and exclusion criteria were deemed eligible to participate in the study.

A multidisciplinary team of authors developed the survey questionnaire with closed-ended questions based on reliable, previously validated scales.¹⁹⁻²⁰ The final version of the questionnaire was pretested among 20 patients to assess question clarity and acceptability. The questionnaire had three parts. The first part covered questions related to sociodemographic variables and clinical information [e.g., age, gender, education, rural background, marital status, income (PKR), family history of diabetes, duration of patients in years diagnosed with type 2 diabetes), while the second part included yes/no questions regarding oral health awareness (e.g., diabetes can make the teeth and gums worse, brushing of the teeth at least two times a day is important for good oral health, flossing the teeth at least once a day is important for good oral health, having dental check-ups at least two times a year is important to manage good oral health). Last but not least, the third section included questions related to self-care practices among diabetic patients (e.g., daily feet check, cigarette smoking status, adherence to therapy, monitoring of blood glucose level at least once every three months, monitoring haemoglobin A1c levels every three months, exercising for 20 to 30 minutes every day for at least five days in a week, brushing of the teeth at least two times a day, flossing the teeth at least once a day, having dental check-ups at least two times a year).

The principal investigator conducted all interviews in a separate room. Each interview lasted from 10 to 12 minutes in the respondent's preferred language (i.e., English, Urdu, or Punjabi).

STATISTICAL ANALYSIS

Data were analysed using the Statistical Package for the Social Sciences version 25 software program (IBM Corp., Armonk, NY, USA). Descriptive statistics were employed to obtain frequencies, percentages and measures of central tendencies. Moreover, Chi-square test was used to achieve the objective of the study i.e.to assess associations between sociodemographic factors and self-care practices among diabetic patients. Statistically significant *P*-value was taken as $\leq .05$.

RESULTS

Of 402 respondents, 64.7% were male (Table-1). Respondents were aged from either 41 to 50 years (33.60%), 31 to 40 years (31.30%), 51 years and older

(30.30%), or 18 to 30 years (4.70%). Nearly half (47.80%) of the respondents were illiterate. An additional 16.40% had completed the 10th standard education, 15.70% had completed the 12th standard education, 12.90% and 6.50% had completed graduate and postgraduate or above education, respectively, while 7.00% had no formal education but were literate. The majority of respondents (84.10%) were married, and 65.40% reported having a rural background. It was also observed that respondents of this study were diagnosed with type 2 diabetes at minimum three and at maximum 15 (mean: 8.304, standard deviation: 2.68) years prior to the survey.

Self-reported, self-care practices among 402 patients diagnosed with type 2 diabetes are given in Table-2. None of the self-care practices were fully adhered to by the patients. Highly-reported self-care practices included monitoring of random blood glucose levels at least once every 3 months (83.10%), use of drug therapy on daily basis (78.40%), regular monitoring of haemoglobin A1c levels every three months (64.40%), flossing the teeth at least once a day (55.50%), brushing the teeth at least two times a day (52.20%), and having dental checkups at least two times a year (50.50%). Few patients (29.90%) reported observing their feet on a daily basis.

The majority of patients (76.10%) were aware of the oral comorbidities of diabetes. Conversely, a minority (36.30%) reported that attending dental check-ups at least twice a year is important for maintaining good oral health (Table-3). Table-4 shows the association between sociodemographic variables and self-care

practices among diabetic patients. Gender, marital status, and brushing of the teeth at least two times a day were the variables most related to self-care

Table-1: Demographic information of diabetic patients (n = 402).

Demographic Information	N	Percent (%)
Age (years)	18–30 years	19 4.70
	31–40 years	126 31.30
	41–50 years	135 33.60
	51 years and above	122 30.30
Gender	Female	142 35.30
	Male	260 64.70
Education	Postgraduate or above	26 6.50
	Graduate	52 12.90
	12th standard	63 15.70
	10th standard	66 16.40
	Literate with no formal education	3 7.00
	Illiterate	192 47.80
Marital status	Unmarried	64 15.90
	Married	338 84.10
Rural background	Yes	263 65.40
	No	139 34.60
Income (PKR)	No income	41 10.20
	Below 20,000	36 9.00
	20,000–30,000	63 15.70
	30,001–40,000	88 21.90
	40,001–50,000	66 16.40
	Above 50,000	108 26.90
Family history of diabetes mellitus	Yes	276 68.70
	No	126 31.30

Table-2: Self-care practices of diabetic patients (n = 402).

Self-care Practices	Yes n (%)
Daily feet check	120 (29.90)
No cigarette smoking	182 (45.30)
Taking drugs every day/regularly	315 (78.40)
Checking random blood glucose level at least once every three months	334 (83.10)
Checking haemoglobin A1c levels every three months	259 (64.40)
Exercising for at least five days/week for 20 to 30 minutes	149 (37.10)
Brushing teeth at least two times a day	210 (52.20)
Flossing teeth at least once a day	223 (55.50)
Dental check-ups at least two times a year	203 (50.50)

Table-3: Oral health awareness among diabetic patients (n = 402).

Self-care Practices	Yes n (%)
Diabetes can make teeth and gums worse	269 (66.90)
Brushing teeth at least two times a day is important for good oral health	306 (76.10)
Flossing teeth at least once a day is important for good oral health	184 (45.80)
Dental check-ups at least two times a year is important to manage good oral health	146 (36.30)

practices. Smoking cigarette history differed evidently by gender, with 45.38% of males but 1.41% of females reporting a smoking habit (P=0.001) (Table-4).

Gender was also related to different self-care practices, including daily feet monitoring ($P = 0.001$), brushing of the teeth at least two times a day ($P = 0.001$), flossing the teeth at least once a day.

Table 4: Association between sociodemographics and self-care practices among type 2 diabetes patients.

N	Chi-Square (x ²)		No cigarette smoking		Chi-Square (x ²)		Taking drugs every day/regularly	
	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)	No n (%)	Yes n (%)
Daily feet check								
142	49 (34.51)	93 (65.49)	140 (98.59)	2 (1.41)	84.819	0.001*	26 (18.31)	116 (81.69)
260	171 (65.77)	89 (34.23)	142 (54.62)	118 (45.38)			61 (23.46)	199 (76.54)
190	95 (50.00)	95 (50.00)	140 (73.68)	50 (26.32)			46 (24.21)	144 (75.79)
212	125 (58.96)	87 (41.04)	142 (66.98)	70 (33.02)	2.150	0.087	41 (19.34)	171 (80.66)
Checking random blood glucose level at least once every three months								
64	16 (25.00)	48 (75.00)	22 (34.38)	42 (65.63)	0.048	0.474	32 (50.00)	32 (50.00)
338	52 (15.38)	286 (84.62)	121 (35.80)	217 (64.20)			221 (65.38)	117 (34.62)
190	30 (15.79)	160 (84.21)	62 (32.63)	128 (67.37)			132 (69.47)	58 (30.53)
212	38 (17.92)	174 (82.08)	81 (38.21)	131 (61.79)	1.359	0.144	121 (57.08)	91 (42.92)
88	8 (9.09)	80 (90.91)	28 (31.82)	60 (68.18)			55 (62.50)	33 (37.50)
314	60 (19.11)	254 (80.89)	115 (36.62)	199 (63.38)	0.693	0.241	198 (63.06)	116 (36.94)
Brushing teeth at least two times a day								
142	37 (26.06)	105 (73.94)	40 (28.17)	102 (71.83)	23.786	0.001*	90 (63.38)	52 (36.62)
260	155 (59.62)	105 (40.38)	139 (53.46)	121 (46.54)			109 (41.92)	151 (58.08)
64	24 (37.50)	40 (62.50)	25 (39.06)	39 (60.94)			37 (57.81)	27 (42.19)
338	168 (49.70)	170 (50.30)	154 (45.56)	184 (54.44)	0.920	0.206	162 (47.93)	176 (52.07)
88	40 (45.45)	48 (54.55)	38 (43.18)	50 (56.82)			25 (28.41)	63 (71.59)
314	152 (48.41)	162 (51.59)	141 (44.90)	173 (55.10)	0.083	0.435	174 (55.41)	140 (44.59)
Dental check-ups at least two times a year								
142	37 (26.06)	105 (73.94)	40 (28.17)	102 (71.83)	23.786	0.001*	90 (63.38)	52 (36.62)
260	155 (59.62)	105 (40.38)	139 (53.46)	121 (46.54)			109 (41.92)	151 (58.08)
64	24 (37.50)	40 (62.50)	25 (39.06)	39 (60.94)			37 (57.81)	27 (42.19)
338	168 (49.70)	170 (50.30)	154 (45.56)	184 (54.44)	0.920	0.206	162 (47.93)	176 (52.07)
88	40 (45.45)	48 (54.55)	38 (43.18)	50 (56.82)			25 (28.41)	63 (71.59)
314	152 (48.41)	162 (51.59)	141 (44.90)	173 (55.10)	0.083	0.435	174 (55.41)	140 (44.59)

($P = 0.001$), and having dental check-ups at least two times a year ($p = 0.001$). Checking the feet daily ($P = 0.001$) and exercising for at least five days per week for at least 20 to 30 minutes each time also varied by education level of the respondents.

DISCUSSION

The majority of study participants were males and had been diagnosed with type 2 diabetes with a disease history of three to 15 years at the time of their interview. No standard self-care practice of diabetes was adhered to by all patients. Patients did well with checking their random blood glucose level and taking their medications/drugs regularly. However, daily feet checking was the lowest self-care practice among patients, followed by exercising for at least five days per week for 20 to 30 minutes. The majority of patients also had awareness that brushing the teeth twice a day is a key factor to managing good oral health. On contrary, less had awareness about that flossing the teeth once a day and having dental check-ups at least twice a year are other important aspects to maintaining good oral health. Patients with diversified sociodemographic characteristics did not fully meet the standards of diabetes self-care practices. Sociodemographic indicators of gender, education, marital status, and income were associated with adherence to recommended self-care practices. Gender was the most important socio-demographic indicator affecting self-care among patients with diabetes.

With respect to overall adherence to self-care practices, Bhatti et al. (2019) reported similar findings that no standard practices were fully followed by all of their patients.¹⁹ The overall trend of smoking cigarettes among people with diabetes was similar in those reported on by researchers in India and Pakistan.^{19,21} Dinesh

et al. (2016) and Bhatti et al. (2019) revealed that 46.75% and 56.00% of patients with type 2 diabetes were non-smokers, respectively; on the contrary, Raithatha et al. (2014) reported that 88.3% of their study respondents were non-smokers.^{19,21,22} The results of our study are also consistent with those from a study conducted in Iran and Pakistan, which showed an association between gender and cigarette smoking.^{19,23} The same was observed in a study conducted in Nepal, which highlighted that the use of tobacco among men was higher than among women.²⁴ The high magnitude of cigarette smoking can be connected with the fact that the government of Pakistan has steadily increased the prices of tobacco, but not so much as to control tobacco abuse, in order to generate more revenue.²⁵ Lower prices generally result in more utilization of tobacco and its products by the general public irrespective of their socioeconomic status but also puts diabetic patients at

higher risk for serious complications (e.g., heart and kidney diseases).^{25,26}

The results of this study were slightly different from those of other such studies on self-care practices included exercising and checking the feet daily, for instance. In one study, a small proportion of the patients (20.5%) exercised at least 20 to 30 minutes for at least five days per week, whereas only 0.5% of persons with diabetes reported regularly monitoring their feet.²¹ Our findings were similar to those of another Pakistani study with respect to the rates of checking blood sugar at least once every three months (67.00%).¹⁹

Previous studies have also shown mixed findings regarding foot care differences by gender but, consistent with our work, one investigation suggested that foot care practices vary by gender, whereas an Indian study showed no differences among the genders regarding foot care.^{19,24} The findings that females were more likely to adhere to brushing their teeth twice a day and flossing once a day may be related with women's tendency to be more hygienic than their male counter-parts.²⁷ Indeed, gender is the most important socio-demographic indicator for self-care among patients with diabetes in developing countries.^{19,24}

The results of this study are also consistent with findings of that level of education is associated with the self-care practices of foot care and exercise.¹⁹ In general, patients with low literacy are more likely to adhere to physician counselling regarding diabetes self-management. This might be the reason for why these patients may be more likely to understand about their disease and also manage themselves well as compared with highly literate people, who have a better general understanding of medical treatment.¹⁹ Patients with no formal education may be more likely to follow doctor's instructions, showing more compliance to foot care than educated patients do and checking their feet on a daily basis.¹⁹ On the other hand, highly literate patients may also have better resources with which to manage their health through regular exercise as compared with more uneducated patients.¹⁹

In contrast to our findings, monthly household income has not been previously associated with self-care practices.^{22,28} Bhatti et al. (2019) explained the association between adherence to self-care practices and in-come and stated that a good income as well as a prosperous family and good work life can influence patients to acquire glucose monitoring equipment and consult physicians more often than those who are not as affluent financially.¹⁹ In other terms, this can be expressed as that patients with a higher socioeconomic status may be more aware of their disease than those with a lower socioeconomic status.^{19,29} Lastly, a small proportion of the patients consult dentists for dental check-ups at least two times a year, which may be

explained by the fact that consulting dentists are usually considered as expensive and, to avoid such expenditures, patient usually avoid visiting dentists.³⁰

CONCLUSION

In conclusion, this study showed that self-care practices as well as the oral health care of patients with diabetes are affected by various sociodemographic indicators. Clinically, this information can be applied to design and target education and care planning initiatives for patients with type 2 diabetes. Providing special attention to patients with diabetes would allow for the provision of realistic recommendations regarding self-care.

LIMITATIONS OF STUDY

Although this study provides valuable insights into the influence of sociodemographic factors on self-care practices among patients with type 2 diabetes, it does have some limitations. Owing to limited resources, only patients visiting a private hospital were surveyed. The experiences and socioeconomic profiles of patients in other settings may differ. Future, larger-scale surveys could enhance the present study findings to strengthen the conclusions about self-care practices among patients with type 2 diabetes.

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AUTHOR'S CONTRIBUTION

RA: Substantial contributions to conception and design of study

MC: Acquisition of data.

MN: Analysis and interpretation of data.

HMD, HUM, YI: Drafting the article, revising it critically for important intellectual content.

CONFLICT OF INTEREST

None to declare.

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REFERENCES

1. World Health Organization. Global report on diabetes, 2016. Available online at: https://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf;jsessionid=B525639191129C50DE99E77B4B5BE708?sequence=1. [Last accessed in June, 2018].
2. Emerging risk factors collaboration. Diabetes mellitus, fasting blood glucose concentration, and risk of vascular

- disease: a collaborative meta-analysis of 102 prospective studies. *Lancet*. 2010; 375 (9733): 2215-22.
3. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4.4 million participants. *Lancet*. 2016; 387 (10027): 1513-30.
4. Narayan KV, Fleck F. The mysteries of type 2 diabetes in developing countries. *Bull World Health Organ*, 2016; 94(131): 241-2.
5. Hussain A, Ali I. Diabetes mellitus in Pakistan: A major public health concern. *Arch Pharm Pract*. 2016; 7 (1): 30-7.
6. Aamir AH, Ul-Haq Z, Mahar SA, Qureshi FM, et al. Diabetes Prevalence Survey of Pakistan (DPS-PAK): prevalence of type 2 diabetes mellitus and pre-diabetes using HbA1c: a population-based survey from Pakistan. *BMJ Open*, 2019; 9 (2): 025300.
7. Tarin SM. Global 'Epidemic' of diabetes. *J Nish Med*. 2010; 2(7): 56-60.
8. Din I. Health Outcomes and the Pakistani population: *Camb Sch Pub*. 2014. Available online at: <https://www.cambridgescholars.com/download/sample/62031>. [Last accessed in June, 2018].
9. World Health Organization. Diabetes country profiles, 2016. Available online at: https://www.who.int/diabetes/country_profiles/diabetes_profiles_explanatory_notes.pdf?ua. [Last accessed in June, 2018].
10. Krag MØ, Hasselbalch L, Siersma V, Nielsen AB, et al. The impact of gender on the long-term morbidity and mortality of patients with type 2 diabetes receiving structured personal care: a 13-year follow-up study. *Diabetologia*. 2016; 59 (2): 275-85.
11. Walker RJ, Gebregziabher M, Martin-Harris B, Egede LE, et al. 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.
12. Hill J, Nielsen M, Fox MH. Understanding the social factors that contribute to diabetes: a means to informing health care and social policies for the chronically ill. *Perm J*. 2013; 17 (2): 67-72.
13. Dagenais GR, Gerstein HC, Zhang X, McQueen M, et al. Variations in diabetes prevalence in low-, middle-, and high-income countries: Results from the prospective urban and rural epidemiology study. *Diab Care*. 2016; 39 (5): 280-7.
14. Mondesir FL, White K, Liese AD, McLain AC, et al. Gender, illness-related diabetes social support, and glycemic control among middle-aged and older adults. *J Gerontol B Psychol Sci Soc Sci*. 2015; 71 (6): 1081-8.
15. Rahaman K, Majdzadeh R, Naieni K, Raza O. Comorbidities and care practices of diabetic patients. *Austin J Pub Health Epi*. 2017; 4 (2): 1059-65.
16. Gonzalez-Zacarias AA, Mavarez-Martinez A, Arias-Morales CE, Stoicea N, et al. Impact of demographic, socioeconomic, and psychological factors on glycemic self-management in adults with type 2 diabetes mellitus. *Front Pub Health*. 2016; 4(5): 195-202.
17. Daoud N, Osman A, Hart TA, Berry EM, et al. Self-care management among patients with type 2 diabetes in East Jerusalem. *Health Educ J*. 2015; 74 (5): 603-15.

18. World Health Organization, and Council for International Organizations of Medical Sciences. International ethical guidelines for health-related research involving humans, 2016.
19. Bhatti ZI, Manzoor N, Korai NA, Khaliq IH, et al. Impact of sociodemographic factors on self-care practices among patients with type 2 diabetes in Lahore, Pakistan: an exploratory study. *J Fatima Jinnah Med Univ.* 2018; 12 (4): 166-171.
20. Yuen HK, Wolf BJ, Bandyopadhyay D, Magruder KM, et al. Oral health knowledge and behavior among adults with diabetes. *J Diabetes Res & Clini Prac.* 2009; 86 (3): 239-46.
21. Dinesh PV, Kulkarni AG, Gangadhar NK. Knowledge and self-care practices regarding diabetes among patients with Type 2 diabetes in Rural Sullia, Karnataka: A community-based, cross-sectional study. *J Family Med Prim Care.* 2016; 5 (4): 847-53.
22. Raithatha SJ, Shankar SU, Dinesh K. Self-care practices among diabetic patients in Anand District of Gujarat. *ISRN Family Med.* 2014;12(3): 1-6.
23. Tol A, Shojaeezadeh D, Eslami A, Alhani F, et al. Evaluation of self-care practices and relative components among type 2 diabetic patients. *J Educ Health Promot.* 2012; 1 (1): 19-22.
24. Shrestha AD, Kosalram K, Gopichandran V. Gender difference in care of type 2 diabetes. *JNMA.* 2013; 52 (189): 245-50.
25. Pakistan Today. Number of smokers reaches 25 million in Pakistan: Health Ministry, 2017. Available online at: <https://www.pakistantoday.com.pk/2017/12/07/number-of-smokers-reaches-25-million-in-pakistan-health-ministry/>. [Last accessed in September, 2018].
26. Centers for Disease Control and Prevention. Smoking & Diabetes, 2019. Available online at: https://www.cdc.gov/pcd/issues/2019/19_0027.htm. [Last accessed in September, 2018].
27. Alcouffe F. Oral hygiene behavior: differences between men and women. *Clin Prev Denti.* 1989; 11 (3): 6-10.
28. Hailu E, Mariam WH, Belachew T, Birhanu Z. Self-care practice and glycaemic control amongst adults with diabetes at the Jimma University Specialized Hospital in South-West Ethiopia: A cross-sectional study. *Afr J Prim Health Care Fam. Med.* 2012; 4 (1): 311-9.
29. Bodenheimer T, Lorig K, Holman H, Grumbach K. Patient self-management of chronic disease in primary care. *JAMA.* 2002; 288 (19): 2469-75.
30. Abid I, Yousaf A, Akhtar T, Yousaf N, Manzoor MA. Self medication practice among dental patients of AFID: a cross sectional study. *J Pak Oral & Den.* 2012; 32 (3): 513-7.
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