

Perceived self-efficacy and self-care practices among diabetic patients in a Tertiary Hospital, Nepal

Dwa N¹, Panthee B²

¹Community Health Nursing Department, Tribhuvan University, Pokhara Nursing Campus

²Patan Academy of Health Sciences, Lalitpur Nursing Campus, Sanepa, Kathmandu

Abstract

Background: Diabetes Mellitus (DM) is a major public health problem worldwide and Nepal is not an exception. Complications of DM are in rise which results in major disabilities and poor quality of life. But evidences show that adoption of self-care practices can prevent those complications leading a healthy and quality life. Self-care practice is closely related to self-efficacy. Thus, present study aimed to assess perceived self-efficacy and self-care practices and to examine relationship between perceived self-efficacy and self-care practice of patients with Diabetes. **Methods:** This analytical cross-sectional study conducted in Patan Hospital among 100 patients was reviewed and approved by Institutional Review Committee. Samples were selected purposively and data was collected by face to face interview technique. Diabetes Self-Efficacy Scale and self-care practice questionnaire was used to measure self-efficacy and self-care practice, respectively. **Results:** Fifty nine percent and 81% of participants had moderate level of perceived self-efficacy and good self-care practice, respectively. There was significant moderate positive ($r=0.62$, $p<0.001$) correlation between perceived self-efficacy and self-care practice even after controlling the variables (e.g. age, gender and participation in educational program regarding self-care). **Conclusion:** The self-efficacy of participants was moderate and self-care practice was good. However, self-care practice was very low on foot care and exercise. The significant positive relationship between perceived self-efficacy and self-care practice highlights the need for conducting educational activities for patients with DM to increase self-efficacy thereby increasing self-care practice.

Keywords: Diabetic patients, Perceived self-efficacy, Self-care practices.

Background

Diabetes Mellitus (DM) is a major public health problem worldwide.¹ Globally, the number of adults living with DM was 463 million in 2019, of which, 79% were living in low and middle income countries.² The global prevalence of DM is estimated to increase from 8.8% in 2015 to 10% in 2030.³ On the other hand, the burden of diabetes has been increased at a greater rate in low and middle-income countries than in high income countries, both in terms of prevalence and number of adults

with DM.⁴ Nepal is not an exception where, it has been estimated that the prevalence of DM will increase from 4.5% in 2013 to 5.4% in 2035.⁵ There were 696,900 cases of DM in Nepal in 2019 which is 4% of the total adult population (17,570,100).² The systematic review and meta-analysis from 2000 to 2014 showed that the prevalence of type 2 DM in Nepal was 8.4%, of which 8.1% in urban population and 1.0% in rural population.⁶ Similarly, the global DM attributed mortality has been increased by 34.7% which is higher to Type 2 DM.⁷ In Nepal, the mortality related to DM has increased from 2% to 4% from 2010 to 2016.^{8,9}

The common diabetes related complications found in Nepalese people are retinopathy (37.3%), diabetic foot (30.4%), peripheral neuropathy (7.8%),

Correspondence Author

Bimala Panthee, Assistant Professor,
Patan Academy of Health Sciences, Lalitpur Nursing Campus,
Sanepa, Kathmandu,
Email: bimupanthee@gmail.com

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cardiovascular diseases (2.9%), and nephropathy (2%)¹⁰, leading to major disabilities that require majority of resources to be used to treat diabetes complications.^{11,12} However, people with diabetes can live long and healthy lives if their diabetes is early detected and well-managed.¹ In order to reduce this burden, there are various modifiable risk factors which can be modified through behavioral changes and patients with diabetes need to adopt self-care behaviors to improve both the quality of life and life expectancy.^{1,11} On the basis of sustainable development goal 3, Nepal has targeted to reduce death from diabetes out of all deaths from 1.7% to 0.5% from 2014 to 2030 which can be achieved by preventing the complications of DM.

Patient's perceived self-efficacy has been shown to have positive correlation with self-care practice.¹⁴ It refers to the level of self-confidence of a person in performing particular goal-directed behavior successfully.¹⁵ In context of DM, these goal-directed behaviors, refer to the self-care practice that patient with DM needs to follow on a daily basis including dietary control, physical activity, adherence to medication, foot care and monitoring blood glucose level¹⁶ which helps to reduce the complications or delay the complications thereby increase the quality of life of patients with DM. A self-efficacy education program on foot self-care behavior of patients with diabetes showed that after the intervention, self-efficacy increased significantly from baseline (median = 30.00 to 44.00, $Z = -4.76$, $p < 0.001$) and also self-care behavior levels significantly increased from baseline (median = 45.00 to 69.00, $Z = -4.86$, $p < 0.001$).¹⁷ Another study showed that higher the self-efficacy score was significantly associated with active self-management behaviors (odds ratio = 1.06; 95% CI: 1.04 – 1.08).¹⁸ Thus, it can be concluded that self-efficacy and self-care behavior of patient with diabetes might have a causal relationship.

The level of self-care practices of patients with DM vary among different countries and also among different regions within the country as well.

In Nepal, there are studies carried out to assess the self-care practice of patients with DM. For instance, it was found that 61.8% of the patients had good practice in a study conducted in Eastern region (Dharan)¹⁹ whereas, it was 47.3% in a study conducted in Western region (Pokhara).²⁰ Similarly, in regard of self-efficacy, it was found moderate and its relationship to self-care practice was positive ($r = 0.47$, $p < 0.001$).¹⁴ In conclusion, self-care practices of patients with DM are different within country and self-efficacy of Nepalese patients with DM has not been explored much. Self-care practices are the activities which are economical and can be carried out by patients themselves to prevent the complications of DM.

The differences found in the results of various studies carried out within the country might have been due to different level of perceived self-efficacy of the patients in various places as it has shown strong correlation with the self-care practices. There are very few studies that explored the perceived self-efficacy and its relationship with self-care practices of the patients with DM in Nepal, thus it is very important to assess the perceived self-efficacy and self-care practices among the patients with DM and their relationship so that interventions can be applied to build up the confidence of the patients in carrying out the self-care activities thereby reducing the complications of DM. Hence, the present research aimed to determine the level of perceived self-efficacy, self-care practices among patients with diabetes and their relationship. This study was guided by Nola J. Pender's health promotion model (1996)¹⁵ where individual characteristics and experiences may directly affect the self-efficacy and self-care practices of patients and the self-care practices may differ with the level of perceived self-efficacy of the patients.

Methods

A cross-sectional analytical study was carried out at Medical Outpatient Department (OPD) of Patan Hospital, Kathmandu, Nepal between September and November 2019.

ORIGINAL ARTICLE



All patients with Type 2 Diabetes Mellitus (T2DM) who were receiving care at Patan Hospital were the study population. We purposively selected 100 samples from patients with T2DM aged ≥ 18 years old who have been diagnosed with T2DM for at least 1 year duration and willing to participate in the study. Patients with Type 1 DM, gestational diabetes were excluded from the study and, also patients with Type 2 DM who were not able to perform activities by themselves and did not understand Nepali language were excluded from the study.

The study was conducted after the ethical approval from Institutional Review Committee, Patan Academy of Health Sciences (Ref: PNC 1906141255). Participants were explained about the research detail, its significance, the benefit and harm in Nepali language before obtaining the consent, their queries were answered. A statement indicating that the participants has understood all the information in the consent form and is willing to participate voluntarily was obtained. Participants were able to withdraw from the study at any time without giving any reason during the study period. The confidentiality of participants was assured and code number was used in each interview schedule and name of the participants was not mentioned anywhere.

Data were collected using Diabetes Self-Efficacy Scale (DSES)²¹ for perceived self-efficacy and self-developed self-care practice related rating scale for self-care practices. Initially self-care practice questionnaire was developed in English. Both tools were forward and backward translated utilizing the guideline^{22,23} The content validity was done (CVI = 0.96). The Cronbach's alpha of the original DSES tool was 0.85.²⁴

Self-efficacy: Diabetes Self-Efficacy Scale (DSES) was used to measure perceived self-efficacy. It is an 8 item 10-point rating scale developed by Self-Management Resource Center. It was modified into a 5-point rating scale as of previous literature considering the cultural context of Nepal where

1 is not at all confident and 5 is totally confident. The Cronbach's alpha of the modified tool in the previous study was 0.78.²⁴ The total score ranges from 8 to 40. Mean of 8 items is the score for the scale. Higher score indicates higher self-efficacy. Level of perceived self-efficacy was categorized into three levels: High (≥ 4), Moderate (3 – 3.9) and Low (< 3).²⁵

Self-care practice: Self-developed questionnaire for self-care practice was used to measure self-care practice. It is a 5-point rating scale in which 5 indicates always, 4 indicates often, 3 indicates sometimes, 2 indicates rarely and 1 indicates never. It consisted of 24 items with 5 domains namely; Diet, Medication, Exercise, Foot care and Blood Glucose Monitoring. Total score ranges from 24 to 120. Mean of the total scores of 24 items was the overall score for the scale. The level of self-care practices was categorized into two levels based on interquartile range where good self-care practice is score > 3 and Poor self-care practice is score ≤ 3 .²⁶ Informed written consent in Nepali language was obtained from each participant. Data was collected by face to face interview using semi-structured interview schedule in Nepali language at OPD setting before doctor check-up. It took approximately 35 minutes for each participant. Each day, 2 to 6 participants were interviewed according to the availability of the participants for a month. Statistical Package for Social Sciences version 16 was used for analysis of data. Descriptive statistics and Pearson's Correlation Coefficient was used for analysis. Data were checked for normal distribution using both graphical presentation (Q-Q plot and histogram) and statistics (Kurtosis, Skewness and Saphiro-Wilk test). It was found that the data were normally distributed. Level of significance was set at 0.05 level.

Results

The median age of participants was 55 years (IQR=15) and most of the participants were female middle aged and most of them had not participated in any self-care practice of DM related educational program (Table 1).

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Table 1. Demographic Characteristics of Patients with Diabetes

N = 100

Variables	Frequency	Percentage
Age (in years)		
20 – 39	2	2
40 – 64	73	73
≥ 65	25	25
Median Age ± IQR = 55 ± 15		
Gender		
Male	31	31
Female	69	69
Attended educational program regarding self-care practice of DM		
Yes	17	17
No	83	83

IQR: Interquartile Range

Self-efficacy and self-care practice

Most of the participants (94%) had moderate to high level of self-efficacy. However, based on the mean score the self-efficacy was moderate (Table 2). Regarding self-care practice, 81% of participants had good self-care practice and based on the mean score the average self-care practice was good (Table 2).

Table 2. Level of Perceived Self-efficacy and Self-care Practice of Patients with Diabetes N = 100

Level of perceived self-efficacy	Frequency	Percentage
High perceived self-efficacy (score ≥4)	35	35
Moderate perceived self-efficacy (score 3 – 3.9)	59	59
Low perceived self-efficacy (score <3)	6	6
Mean ± SD = 3.73±0.56		
Level of self-care practices		
Good self-care practice (score >3)	81	81
Poor self-care practice (score ≤3)	19	19
Mean ± SD = 3.35 ± 0.40		

SD: Standard Deviation

When analyzing each domain of self-care practice, the highest self-care practice carried out by the participants was on blood glucose monitoring, followed by medication, diet, and lowest was on foot care and exercise (Table 3).

Table 3. Mean score and standard deviation of each domain of Self-care Practice N = 100

Domains	Total number of items in the domain	Minimum score	Maximum score	Mean	SD
Diet	8	2.38	4.75	3.88	0.44
Medication	4	2.75	5.00	4.01	0.60
Exercise	2	1.00	5.00	2.39	0.96
Foot Care	7	1.00	5.00	2.23	0.76
Blood Glucose Monitoring	3	2.67	5.00	4.35	0.63

SD: Standard Deviation

Correlation between self-efficacy and self-care practice

There was significant positive moderate correlation ($r = 0.62, p < 0.001$) between perceived self-efficacy and self-care practice of participants even after controlling age, gender and education regarding self-care practice (Table 4).

ORIGINAL ARTICLE



**Table 4. Correlation between Perceived Self-efficacy and Self-care Practices of Patients with Diabetes
 N = 100**

Control variables	Zero-order correlation		
		Perceived Self-efficacy	Self-care Practice
None	Perceived Self-efficacy	1	
	Self-care Practice	0.63*	1
Control variables	Partial correlation		
		Perceived self-efficacy	Self-care practice
Age, gender and attending educational program	Perceived self-efficacy	1	
	Self-care practice	0.62*	1

*. Correlation is significant at the 0.01 level (2-tailed).

Discussion

The average perceived self-efficacy of the participants was moderate. This finding is similar to the study conducted in Indonesia.²⁵ However, in a study conducted in Malaysia average perceived self-efficacy among patients with diabetes was high.¹⁶ The individual characteristics and experiences of participants may directly affect their perceived self-efficacy.¹⁵ In this study, personal factors (age, gender, and attending educational program related to diabetic self-care practices) may have affected the perceived self-efficacy of participants but its effect has not been studied in this study. These factors may have direct effect on the self-efficacy of participants as suggested by the Health Promotion Model which implies, younger patients may have higher self-efficacy than elder patients and patients who have attended educational programs may have better self-efficacy. Some of the factors as explored by previous studies that affect perceived self-efficacy are educational level, diabetes distress, and depression.²⁷ Self-efficacy is found to be higher among patients having higher educational level and lower among depressed and distressed patients.²⁷ Regarding self-care practice, average self-care practice of participants was good. This finding is similar to the study conducted in Dharan, Nepal¹⁹ and also a study conducted in Ethiopia.²⁸ On the other hand, in a study conducted in India²⁹ and in Pokhara, Nepal²⁰, the average self-care practice of participants was poor. The self-care practices of the patients with diabetes at different places of

Nepal are found to be different. It may be due to various factors such as characteristics of patients or their level of self-efficacy as suggested by the Health Promotion Model of Pender. The clients who never attended diabetes health education program had 4 times more chances of having poor self-care practice (AOR = 4.09, 95% CI 1.89,8.84, p <0.001) than who had attended the program.²⁸ On the other hand, it was found that males, who had higher education, and those with a higher per-capita income were found to have better self-care practices in most aspects like physical exercise, regular blood sugar testing and follow up visits.²⁹ However, in this study, when analyzing the score the average score falls on the lower boarder (i.e. 3.35) indicating that there is still need to increase the level of self-care practice of patients with DM. It is important to conduct similar studies at various parts of the country to generalize the actual scenario of the self-care practices of patients as a whole. In this study, about 20% of participants had poor self-care practice, who are at higher risk of developing diabetes related complications which will affect their quality of life and also increase the health care expenditure.

When analyzing the domain of the self-care practice, the highest self-care practices carried out was on blood glucose monitoring followed by medication whereas, least performed self-care practice was on foot care. This finding is similar to the study conducted in India.³⁰ However, in the

ORIGINAL ARTICLE



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study conducted in Malaysia¹⁶, least performed self-care was blood glucose testing. The findings of this study suggest that it is necessary to focus on the least performed self-care practice of participants which is on foot care and exercise as it has been found that about 30% of diabetic related complications in Nepali patients with DM are diabetic foot.¹⁰ There are various factors which affect the self-care practices of patients with DM such as education level, employment status, and duration of illness, perceived social support, and perceived self-efficacy¹⁹ as demonstrated by various studies suggesting exploring the factors affecting the self-efficacy of patients with DM in different settings.

In this study, there was significant moderate positive correlation between perceived self-efficacy and self-care practice of participants ($r = 0.62$, p -value < 0.001) even after controlling the variables such as age, gender and attending educational program. This finding is similar to the study conducted in Malaysia ($r = 0.538$, $p < 0.001$)¹⁹ and Iran ($r = 0.39$, $p < 0.001$).³¹ This positive relationship between self-efficacy and self-care practice implies that one of the measures for improving self-care practices of the patients with DM is to uplift their self-confidence in performing those activities. Improving their self-care practices will help to prevent the complications of diabetes.

Limitation of the study

The findings of the study may not be generalized to all the patients of DM in Nepal as it was conducted in only one setting at tertiary hospital. Probability sampling technique covering the larger population may help to generalize the study findings.

Conclusion

The average self-efficacy of patients with DM was moderate and self-care practice was good. However, the score of good self-care practice was on lower side indicating that there is still a need to increase the level of self-care practice of patients with DM. The higher self-efficacy was associated with good self-care practice suggesting that there is a need to

increase the level of self-efficacy of patients with DM from moderate to high self-efficacy.

Declarations

List of abbreviations

CVI: Content Validity Index
DM: Diabetes Mellitus
DSES: Diabetes Self-Efficacy Scale
OPD: Out Patient Department
SD: Standard Deviation
T2DM: Type 2 Diabetes Mellitus

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

ND conceptualized, collected data, analyzed and wrote the manuscript. BP supervised and guided throughout the study from the beginning of the study and critically reviewed the manuscript. All authors read and approved the final manuscript.

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References

1. World Health Organization. Global Report on Diabetes. 2016. https://apps.who.int/iris/bitstream/handle/10665/204871/9789241565257_eng.pdf;jsessionid=38A088334C7E7CB072FC247CC4EB4F24?sequence=1. Accessed 14 Jan 2019.
2. Idf.org: International Diabetes Federation-facts & figure, <https://www.idf.org/aboutdiabetes/what-is-diabetes/facts-figures.html> (2019). Accessed 6 Nov 2020.
3. Bommer C, Sagalova V, Heesemann E, Manne-Goehler J, Atun R, Barnighausen T, et al. Global economic burden of diabetes in adults:

ORIGINAL ARTICLE



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- Projections from 2015 to 2030. *Diabetes Care*. 2018; <https://doi.org/10.2337/dc17-1962>.
4. 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. *The Lancet*. 2016; [https://doi.org/10.1016/S0140-6736\(16\)00618-8](https://doi.org/10.1016/S0140-6736(16)00618-8).
5. Gauriguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and projections for 2035. *Diabetes Res Clin Prac*. 2014 Feb; <https://doi.org/10.1016/j.diabres.2013.11.002>.
6. Gyawali B, Sharma R, Neupane D, Mishra SR, Teijlingen EV, Kallestrup P. Prevalence of type 2 diabetes in Nepal: a systematic review and meta-analysis from 2000 to 2014. *Global Health Action*. 2015; <https://doi.org/10.3402/gha.v8.29088>.
7. GBD 2017 Causes of Death Collaborators. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980-2017: a systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*. 2018; [https://doi.org/10.1016/S0140-6736\(18\)32203-7](https://doi.org/10.1016/S0140-6736(18)32203-7).
8. World Health Organization: Noncommunicable Diseases Country Profiles 2011, [https://www.who.int/nmh/publications/ncd_profiles2011/en/\(2011\)](https://www.who.int/nmh/publications/ncd_profiles2011/en/(2011)). Accessed 26 Apr 2019.
9. World Health Organization. Noncommunicable Diseases Country Profiles 2018. [https://www.who.int/nmh/publications/ncd-profiles-2018/en/\(2018\)](https://www.who.int/nmh/publications/ncd-profiles-2018/en/(2018)). Accessed 26 Apr 2019.
10. Thapa S, Pyakurel P, Baral DD, Jha N. Health-related quality of life among people living with type 2 diabetes: a community based cross-sectional study in rural Nepal. *BMC Public Health*. 2019; <https://doi.org/10.1186/s12889-019-7506-6>.
11. Laditka SB, Laditka JN. Active life expectancy of Americans with diabetes: Risks of heart disease, obesity, and inactivity. *Diabetes Res Clin Prac*. 2015; <https://doi.org/10.1016/j.diabres.2014.10.008>.
12. Smeltzer SC, Bare BG, Hinkle JL, Cheever KH. Brunner and Suddarth's Textbook of Medical-Surgical Nursing. 12th ed. New Delhi: Wolters Kluwer India; 2015.
13. Government of Nepal National Planning Commission. Sustainable Development Goals, 2016 – 2030, National (Preliminary) Report. 2015. <https://www.undp.org/content/dam/nepal/docs/reports/SDG%20final%20report-nepal.pdf>. Accessed 10 Feb 2010.
14. Bhandari P, Kim M. Self-care behaviors of Nepalese adults with Type 2 diabetes. *Nursing Research*. 2016; <https://doi.org/10.1097/NNR.000000000000153>.
15. Pender NJ. Health Promotion Model Manual. University of Michigan. 2011. <https://deepblue.lib.umich.edu/handle/2027.42/85350>. Accessed 25 Apr 2019.
16. Tharek Z, Ramli AS, Whitford DL, Ismail Z, Zulkifli MM, et al. Relationship between self-efficacy, self-care behavior and glycaemic control among patients with type 2 diabetes mellitus in the Malaysian primary care setting. *BMC Family Practice*. 2018; <https://doi.org/10.1186/s12875-018-0725-6>.
17. Sharoni SKA, Abdul Rahman H, Minhat HS, Ghazali SS, Ong MHA. A self-efficacy education programme on foot self-care behavior among older patients with diabetes in a public long-term care institution, Malaysia: a Quasi-experimental Pilot Study. *BMJ Open*. 2017;7:e014393. doi: 10.1136/bmjopen-2016-014393.
18. Yao J, Wang H, Yin X, Yin J, Guo X, Sun Q. The association between self-efficacy and self-management behaviors among Chinese patients with type 2 diabetes. *PLoS ONE*. 2019;14(11):e0224869. <https://doi.org/10.1371/journal.pone.0224869>.
19. Nepal C, Vyas P, Bhattarai R, Acharya B, Thapa K, Shrestha JS, et al. Knowledge, attitude and practice of type 2 diabetic patients of selected outreach clinic, Dharan, Nepal. *Al Ameen J Med Sci*. 2017;10(1):78-85.
20. Ghimire GD, Devi AW. Self-management behaviors among patients with type 2

ORIGINAL ARTICLE



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- diabetes at Manipal Teaching Hospital, Nepal. *International Journal of Nursing Education*. 2018 Apr-Jun; <https://doi.org/10.5958/0974-9357.2018.00039.9> .
21. Self-Management Resource Center. Self-Efficacy for Diabetes. <https://www.selfmanagementresource.com/resources/evaluation-tools/english-evaluation-tools>. Accessed 1 Apr 2019.
 22. Wild D, Grove A, Martin M, Eremenco S, McElroy S, Verjee-Lorenz A, et al. Principles of good practice for the translation and cultural adaptation process for Patient Reported Outcomes (PRO) measures: Report of the ISPOR Task Force for translation and cultural adaptation. *Value in Health*. 2005; <https://doi.org/10.1111/j.1524-4733.2005.04054.x>
 23. Panthee B, Shimazu A, Kawakami N. Validation of Nepalese version of Utrecht work engagement scale. 2015; <https://doi.org/10.1539/joh.14-0041-OA>.
 24. Lorig K, Ritter PL, Villa FJ, Armas J. Community-based peer-led diabetes self-management: A randomized trial. *The Diabetes Educator*. 2009; <https://doi.org/10.1177/0145721709335006>.
 25. Kurnia AD, Amatayakul A, Karuncharernpanit S. Predictor of diabetes self-management among type 2 diabetics in Indonesia: Application theory of the health promotion model. *International Journal of Nursing Sciences*. 2017 Jul; <https://doi.org/10.1016/j.ijnss.2017.06.010>.
 26. Panta PP. Quartile deviation (semi-inter-quartile range). In: *Measure of dispersion and variability*. Kathmandu: Vidyarthi Pustak Bhandar Nepal; 2018. p. 65.
 27. Casidy D, Chinna K. Depression, distress and self-efficacy: The impact on diabetes self-care practices. *PLOS ONE*. 2017 March; <https://doi.org/10.1371/journal.pone.0175096>.
 28. Chali SW, Salih MH, Abate AT. Self-care practice and associated factors among diabetes mellitus patients on follow up in Benishangul Gumuz Regional State Public Hospitals, Western Ethiopia: a cross-sectional study. *BMC Res Notes*. 2018; <https://doi.org/10.1186/s13104-018-3939-8>.
 29. Suguna A, Magal AS, Stany A, Sulekha T, Prethesh K. Evaluation of self-care practices among diabetic patients in a rural area of Bangalore district, India. *Int.J.Curr.Res.Aca. Rev*. 2015;3(6):415-422.
 30. Dinesh PV, Kulkarni AG, Gangadhar NK. Knowledge and self-care practices regarding diabetes among patients with type 2 diabetes in Rural Sulla, Karnataka: A community-based, cross-sectional study. *J Family Med Prim Care*. 2016 Oct-Dec; <https://doi.org/10.4103/2249-4863.201176>.
 31. Karimy M, Koohestani HR, Araban M. The association between attitude, self-efficacy, and social support and adherence to diabetes self-care behavior. *Diabetol Metab Syndr*. 2018; <https://doi.org/10.1186/s13098-018-0386-6>.