Screening for mental illness using GMHAT App of patients with Type 2 diabetes mellitus at a teaching institute hospital in India – A cross sectional study

Sumanth M. Majgi[1], Nihar Mal Mal[1], Murali Krishna[2,3], Harshini Suresh[1], Ikenna D. Ebuenyi[4], Steven Jones[5]

[1]Department of Community Medicine, Mysore Medical College and Research Institute, Mysore, Karnataka, India, [2]Department of Psychiatry, JSS Medical College, Mysore, Karnataka, India, [3]Centre for Mental Health and Society, University of Bangor, North Wales, UK, [4]IRIS Centre, School of Nursing, Midwifery and Health Systems, University College Dublin, Beifield, Ireland, [5]Director of International Health Faculty of Medicine, Health and Social Care, Castle Drive, Chester, UK

Abstract

People with diabetes will have some coexisting mental illness most of the time and its evaluation and management are essential for the well-being of the person. With this background, the Global Mental Health Assessment Tool (GMHAT) app was used to screen for mental illness among type 2 diabetes mellitus patients attending a tertiary care hospital in Mysore, India. **Methods**: A cross-sectional study was conducted on 100 patients who were on treatment for type 2 diabetes for at least 6 months from the Out-Patient Department of KR Hospital, Mysore. Interviews were conducted using a structured GMHAT. Data were entered in MS Excel and analysed using SPSS version 21.0. Chi-square, Independent T-test/Mann–Whitney tests were used to investigate associations between the variables. **Results**: The mean age of the study participants was 48.8 ± 11.6 years. Among the 100 diabetic patients, 39% (*n* = 39) had mental illness and among the 39 subjects, 21% had depression, 14% had anxiety disorder and 4% suffered from organic disorder. Apart from diabetes, 29, 17, 13, 27, 23 and 20% had hypertension, chronic kidney disease, liver disease, retinopathy, neuropathy and nephropathy, respectively, as comorbid conditions. **Conclusion**: There is a higher prevalence of mental illness in patients with diabetes mellitus. The prevalence rate increases with an increase in the chronicity of diabetes. The use of the GMHAT app could help in rapid assessment and accurate diagnoses.

Keywords: Diabetes mellitus, GMHAT, mental illness

Introduction

In recent years, the comorbidity of mental disorders with chronic health conditions has emerged as a topic of considerable clinical and policy interest. There is an association between diabetes and psychological distress that requires a therapeutic collaborative partnership between the health care staff and the patient. There has been a growing interest in the study of psychological distress and mental disorders in diabetes. Some epidemiological studies have found higher prevalence rates of depression and anxiety disorders in people with diabetes (PWD) compared with the general population. Studies evaluating the relationship between depression and diabetes have yielded varied results. The prevalence of depression is three times higher in people with type 1 diabetes and twice higher in people with type 2 diabetes compared to those without diabetes.[1] Among people suffering

Access this article online

Quick Response Code:

Website:
www.jfmpc.com

DOI:
10.4103/jfmpc.jfmpc_277_22

How to cite this article: Majgi SM, Mal NM, Krishna M, Suresh H, Ebuenyi ID, Jones S. Screening for mental illness using GMHAT App of patients with Type 2 diabetes mellitus at a teaching institute hospital in India – A cross sectional study. J Family Med Prim Care 2022;11:5924-9.

from diabetes, one in four individuals is affected by depression.[2] The prevalence of depression in PWD ranges from 3.8% to as high as 49.5%.[3]

There is a growing recognition both in low-income and high-income countries that comprehensive mental health services may not be provided without the active involvement of primary health care teams. Early diagnosis could be more helpful in treating the patient and earlier interventions that tackle this disease in more effective ways.[4] Due to the high burden of mental illness, the resources and policies must be prioritised for mental health. Community-based services are an effective way to address mental illness and provide mental health care.[5] There is a need for this study in a country like India where depression is considered a taboo and people are fearful of going to a psychiatrist.[6]

Primary health care is the centre of every patient's care including diabetes and mental health. Concerning mental health care, India is still struggling to perfect the integration of mental health services with primary care. If there is intense political will, coordination and commitment from all sectors, we too can achieve a successful primary mental health care services. As the primary care physicians are more close to the population, the basic primary mental health care services can be achieved more easily compared to tertiary care.[7]

Facilitating mental health assessments and the earlier recognition and treatment of mental health issues is a key aim of GMHAT. A new app by the name GMHAT has been developed. GMHAT has proven clinical utility globally and is validated for use in Indian populations. The other speciality of this app is that it can be used by anyone (with some training) and there is no need for a trained psychiatrist for the assessment. The app uses simple questions for the analysis of the mental status of the patient and provides a report on whether the patient should be referred to a psychiatrist. With this background, the study measured the prevalence of mental illness among type 2 diabetes mellitus in patients attending OPD in a tertiary care centre using the GMHAT app and also to test the feasibility of the use of the app for the same purpose in the OPD setting.

Materials and Methods

It was a cross-sectional study undertaken by interviewing 100 subjects on treatment for type 2 diabetes for at least 6 months (June 2019 – November 2019) from the Out-Patient Department of KR Hospital using the structured interview format of the Global Mental Health Assessment Tool (GMHAT).[8] The GMHAT/PC is a computerised clinical assessment tool developed to assess and identify mental health problems in primary care. The app has been used in various studies involving subjects suffering from chronic obstructive pulmonary disorders and an average time of 15 min for the completion of the analysis. All data are recorded onto GMHAT. GMHAT contains simple questions regarding the mental and social health and behaviour of the subjects suffering from diabetes. The tool consists of a series of questions leading to a comprehensive yet quick mental state assessment focusing sequentially on the following symptoms or problems: worries; anxiety and panic attacks; concentration; depressed mood, including suicidal risk; sleep; appetite; eating disorders; hypochondriasis; obsessions and compulsions; phobia; mania/hypomania; thought disorder; psychotic symptoms (delusions and hallucinations); disorientation; memory impairment; alcohol misuse; drug misuse; personality problems; stressors and family support.[9] Ethical clearance was obtained from the Institutional Ethics Committee.

Inclusion and exclusion criteria

The inclusion criteria were subjects having type 2 diabetes mellitus and above the age of 18 years. Informed consent was obtained from the patients before interviewing them. Socio-demographic details of the subjects were taken before the interview to select the subjects for the study.

The administration of the questions was undertaken on the app, the questions proceeded in a clinical order along a tree-branch structure. For each of the major clinical disorders, there are one or two screening questions. If the subject does not have symptoms based on the first one or two items of a subsection, the interview moves on to the next subsection, thus, saving valuable time. Most of the questions are based on the well-established interview schedule GMS-AGECAT.[10] After the interview was completed, the computer generated a number relating to the point grading system, based on which the subject is identified as requiring referral to mental health services or not. The app provides the mental illness diagnosis. The validity of the questionnaire has already been undertaken in earlier publications.[8,11]

Statistical analysis methods

Data were entered in MS Excel and analysed using SPSS version 21.0. Summary statistics were completed by using mean, standard deviation and 95% confidence interval. Inferential statistics tests like Chi-square, Independent T-/Mann–Whitney were used to test the association between various variables.

Results

The majority of the subjects belonged to 41–50 years of age and the mean age of the study subjects was 48.8 ± 11.6 years (minimum – 24 years and maximum –81 years). Among the 100 study participants, 60% were males, 75% of them were married, the majority belonged to the below poverty line (BPL) category (65%), 38% were diabetic for >5 years, 35% were between 6 months and 5 years and 27% were <6 months, 29% had hypertension, 17% had chronic kidney disease, 13% had liver disease, 27% had retinopathy, 23% had neuropathy, 20% had nephropathy and 75% had family support.

Table 1 shows that out of the 100 subjects interviewed using the GMHAT app, 39 subjects were found to be suffering from mental illness of some sort.

Table 2 identifies the prevalence of mental illness in various demographic distributions. Among different age groups, people aged above 60 years with diabetes suffered from mental illness the most (61.5%) and different age groups had a significant association with mental illness (p < 0.013). Males were found to be slightly better than females as only around 35% of the males were suffering from mental illness when compared to 45% of the females. There was not much difference between the married and single subjects as around 40% of the married subjects were found to have a mental illness while 36% of the unmarried subjects had some sort of mental illness; 45.70% of the subjects who were above the poverty line were suffering from mental illness. The prevalence of mental illness was high among chronic diabetics (47.4%). Gender, marital status, SES and time since diagnosis did not have any significant association with mental illness.

Table 3 shows that there is a relationship between chronicity of diabetes with complications, comorbidities and family support. The prevalence of hypertension, chronic liver disease, retinopathy, neuropathy , nephropathy and no family support among subjects with >5 yr duration of diabetes was 36.8%, 21%, 34.2%, 28.9% and 23.7% respectively. Also, there was no association between presence of these co morbidities and the duration since diagnosis of diabetes.

Table 4 shows the prevalence of mental illness among patients with comorbidities and complications among the subjects having hypertension along with diabetes—the prevalence rate of mental illness was 44.8%. Those suffering from chronic kidney disease (CKD) had a prevalence rate of mental illness of 82.4% and those with chronic liver disease had a prevalence rate of 53.8%. Subjects with complications of diabetes like retinopathy, neuropathy and nephropathy had a prevalence rate of 44.4, 56.5 and 70%, respectively. Subjects with diabetes who did not have family support had a prevalence rate of mental illness of 48%. Patients with CKD, neuropathy and nephropathy had a significant association with their mental illness and there was no significant association between hypertension, chronic liver disease, retinopathy and family support with their mental illness.

Table 5 shows that the "*P*" value of age and nephropathy category is highly significant. This shows that there is a very high probability of a diabetic patient getting mental illness if he/she is older, especially above 50 years. The 95% CI for OR is very high for individuals above 60 years indicating that older individuals are prone to mental illness when suffering from any chronic illness. Also, subjects suffering from nephropathy are highly likely to develop a mental disorder, thus, proving the fact that comorbid conditions are highly stressful and can lead to poorer mental health. Thus, both older and patients with comorbidities should be given more care and should be given a higher degree of care and treatment.

Discussion

This study provides some evidence of the prevalence of some form of mental illness among diabetic patients at 39%. Kruse *et al.*[10] found that the prevalence of psychiatric disorders among diabetics was 43.1% and in a meta-analysis by Teshome *et al.*,[12] the prevalence of depression among diabetics was 39.7%. The current study is comparable to previous studies. This may be due to the psychological burden of being ill predisposing them to be anxious and depressed. Another reason for the increase in prevalence might be due to unfavourable lifestyles like physical inactivity, unhealthy diet and a stressful lifestyle.[13]

There is an increased percentage of subjects suffering from mental illness as their age increases. This provides some evidence that as age increases diabetic patients become prone to mental illness. This may be because as age increases, people have more stress and tension and the complications and comorbidities also increase with age. This is also because older individuals have a significant ongoing loss in capacities and a decline in functional abilities.[14] Gender has no role in mental illness among type 2 diabetes subjects.

Table 1: Prevalence of mental illness among study subjects

	n	%
Any Mental illness		
Yes	39	39
No	61	61
Diagnosis		
Anxiety	14	14
Depression	21	21
Normal	61	61
Organic disorder	4	4

Table 2: Prevalence and association of mental illness in various demographic distributions

Variable	Category	Mental illness				*P*
		No		Yes		
		n	%	*n*	%	
Age	<40	20	83.3	4	16.7	0.013
	41-50	22	62.9	13	37.1	
	51-60	14	50	14	50	
	>61	5	38.5	8	61.5	
Gender	Female	22	55	18	45	0.3
	Male	39	65	21	35	
Marital Status	Married	45	60	30	40	0.7
	Single	16	64	9	36	
Socioeconomic Status (SES)	Above Poverty Line	19	54.3	16	45.7	0.3
	Below Poverty Line	42	64.6	23	35.4	
Time since diagnosis (Years)	Chronic (>5 years)	20	52.6	18	47.4	0.3
	Moderate (<5 years to>6 months)	22	62.9	13	37.1	
	Recent (<6 months)	19	70.4	8	29.6	

Table 3: Relationship between comorbidities and complications of diabetes along with chronicity of diabetes

Variable	Category	Time since diagnosis (years)						P
		Chronic (>5 years)		Moderate (<5 year>6 months)		Recent (<6 months)		
		n	%	*n*	%	*n*	%	
Hypertension	No	24	63.2	25	71.4	22	81.5	0.3
	Yes	14	36.8	10	28.6	5	18.5	
Chronic Liver disease	No	30	78.9	31	88.6	26	96.3	0.1
	Yes	8	21.1	4	11.4	1	3.7	
Retinopathy	No	25	65.8	27	77.1	21	77.8	0.5
	Yes	13	34.2	8	22.9	6	22.2	
Neuropathy	No	27	71.1	26	74.3	24	88.9	0.2
	Yes	11	28.9	9	25.7	3	11.1	
Nephropathy	No	27	71.1	29	82.9	24	88.9	0.2
	Yes	11	28.9	6	17.1	3	11.1	
Family support	No	9	23.7	8	22.9	8	29.6	0.8
	Yes	29	76.3	27	77.1	19	70.4	

Table 4: Prevalence of mental illness in complications and comorbidities

Variable	Category	Mental illness				P
		No		Yes		
		Count	Row N%	Count	Row N%	
Hypertension	No	45	63.4	26	36.6	0.5
	Yes	16	55.2	13	44.8	
Chronic kidney disease (CKD)	No	58	69.9	25	30.1	<0.0001
	Yes	3	17.6	14	82.4	
Chronic Liver disease	No	55	63.2	32	36.8	0.2
	Yes	6	46.2	7	53.8	
Retinopathy	No	46	63	27	37	0.5
	Yes	15	55.6	12	44.4	
Neuropathy	No	51	66.2	26	33.8	0.05
	Yes	10	43.5	13	56.5	
Nephropathy	No	55	68.8	25	31.3	0.001
	Yes	6	30	14	70	
Family support	No	13	52	12	48	0.3
	Yes	48	64	27	36	

Marriage alone does not provide a significant difference in the mental status of diabetics as there is not much difference in the prevalence rate. Both married (40%) and single (36%) subjects appear to be affected similarly. This may be because marriage does not seem to add much to the lifestyle modifications required for a diabetic. It helps to control the blood sugar levels and also helps in having constant support in coping with the changes.

In this study, there was a slight increase in the prevalence rate of mental illness in more affluent groups when compared to the poor. In a study done by Rahman *et al.*,[15] rich people (63.2%) had a higher rate of awareness about diabetes than poor people (18.2%). As rich people have more awareness about diabetes, perhaps due to the different kinds of mindset and the amount of knowledge between rich and the poor, rich people are likely to suffer from mental illness.[15]

There is a gradual increase in the percentage of subjects suffering from mental illness as the chronicity of diabetes increases. This may be because diabetes is a multi-system-involving disorder that affects all the systems of the body as time passes. Due to the higher levels of lifestyle modifications and diet restrictions, diabetes has a direct effect on the brain and emotions of a person. Also, as the chronicity increases, the incidences of the complications of diabetes and other comorbid conditions along with diabetes also increase, thus, leading to higher chances of mental disorders.[16,17]

Table 4 suggests that the prevalence of mental illness is higher in chronic diabetics who are also suffering from either comorbidities or complications of diabetes. Similarly, a study done by Lin *et al.*[18] suggested that patients with major depression and diabetes had a 36% higher risk of developing advanced microvascular complications and a 25% higher risk of developing advanced macrovascular complications. This may be because of the higher degree of care the patients need to take in such situations and the higher number of medications that the patient need to consume daily. Thus, reducing patient compliance. This may also be because these comorbidities and complications lead to a further greater change in lifestyle which the patients may not be accustomed to or may not be willing to do.

There certainly seems to be a relationship between diabetes and other comorbidities, especially CKD. This is mainly because the quality of life of these patients is affected much more than the patients with only diabetes. Both the physical and mental health of these individuals is affected. Many people feel helpless, anxious and worry about finances, loss of sexual function and family burdens along with loss of self-independence. This is also because of the increase in the mortality rate and the fear of mortality.[17,19]

There is a significant increase in the occurrence of mental illness in patients with complications of diabetes. This may be because

Table 5: Logistic regression showing an association between mental illness and influencing factors						
Variable	B	Wald	*P*	OR	95% CI for OR	
					Lower	Upper
Age		7.957	0.047			
41-50	1.835	3.931	0.047	6.267	1.021	38.461
51-60	2.338	4.898	0.027	10.362	1.307	82.166
=>61	3.16	7.722	0.005	23.581	2.538	219.115
Gender	-0.23	0.18	0.672	0.794	0.274	2.305
Marital Status	0.075	0.01	0.919	1.078	0.255	4.563
SES	-0.922	2.901	0.089	0.398	0.138	1.149
Time since diagnosis yrs						
Moderate (<5 yrs>6 months)	0.148	0.063	0.802	1.159	0.365	3.687
Chronic (>5 yrs)	0.49	0.457	0.499	1.633	0.394	6.766
Hypertension	-0.125	0.044	0.834	0.882	0.273	2.854
Chronic Liver disease	-1.31	1.781	0.182	0.27	0.039	1.848
Retinopathy	-0.332	0.361	0.548	0.717	0.242	2.123
Neuropathy	0.401	0.455	0.5	1.493	0.466	4.787
Nephropathy	1.757	4.851	0.028	5.793	1.214	27.654
Family support	-0.424	0.477	0.49	0.655	0.197	2.179
Constant	-0.486	0.03	0.862	0.615	0.461	0.794

it affects the quality of life of the patients. It also affects their mindset and their attitude towards being a burden to others in their family. This is also because they need to make further lifestyle modifications and have even more to worry about. This leads to overthinking and overburden on the mind, thus, causing mental disorders.[13,17]

In this study, family support had no significant association with mental illness but family support is essential in the well-being of a diabetic. This is mainly because family support helps in self-management behaviour and also gives moral and emotional support to the subjects. It also increases self-efficacy and helps in having better care and management of the patients. Higher levels of social support are associated with improved clinical outcomes, reduced psychosocial symptomatology and the adaptation to beneficial lifestyle activities.[17,20,21]

Conclusion

There is a higher prevalence of mental illness in patients with diabetes mellitus. The prevalence rate increases with an increase in the chronicity of diabetes. There also seems to be a relation between family support and the prevalence of mental illness. There is stronger relation between mental illness and complications of diabetes, thus, showing a higher prevalence in complicated diabetics.

The increase in the prevalence rate of mental illness in patients suffering from comorbid conditions, especially CKD, provides some evidence that the psychology of patients is affected more when they suffer from a higher number of chronic conditions, thus, requiring a higher degree of care.

Other demographic factors such as gender, marital status and socioeconomic status did not show much difference but the point that people below the poverty line had better mental health than people above the poverty line is slightly surprising. The age of the individual does seem to have a certain degree of relation with the mental status of the individual, thus, producing the need for a higher degree of care in older individuals.

The use of the GMHAT app was easy and rapid and helped in a quick and accurate diagnosis of the subjects. Initially, for the first 10 patients, the time taken for the interview was an average of 23 min. Later, as the experience grew, the interview time was at an average of 15–17 min. The app became easier to use and did not require any extra assistance.

The Global Mental Health Assessment Tool - Primary Care Version (GMHAT/PC) has the following characteristics: a) it is easy to use in day-to-day clinical practice by general practitioners or other health care staff; b) it can detect common psychiatric disorders, yet not neglecting more serious conditions; c) it automatically produces a referral letter to local community psychiatric services.[8]

Recommendations

The study provides some evidence of mental illness prevalence in diabetic individuals and considering that India is the diabetic capital of the world, there is a great need to introduce mental health screening in diabetic treatment clinics. Thus, there is a requirement for modifications in the treatment of diabetic individuals. If time does not permit, all those with diabetes need not be interviewed, but only higher-risk patients such as older individuals, complicated diabetes and patients suffering from comorbid conditions can be further analysed.

The app can be used by every health care professional who is from primary to tertiary care level as it does not require much time and is free of cost with accurate results. The app can be used to reduce the burden of both the patients and doctors. Simple cases like depression and anxiety can be treated by a consulting physician, while the more complex and severe cases can be referred for further assessment and treatment to a psychiatrist. This way, coexisting physical and mental health conditions can be detected and the associated long-term harms (physical and mental) can be managed much earlier.

Key points

- In India, GMHAT has been used for the first time to screen mental health in an non communicable diseases (NCD) clinic.
- As the mental illness among diabetes patients is high, GMHAT can be easily utilised by the primary care physicians which will be more effective in diagnosing these cases at an earlier stage.
- This GMHAT helps in identifying the people who need supportive care and helps in better glycaemic control indirectly, and overall, better patient care. All of these can be achieved by primary care physicians if used appropriately.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Roy T, Lloyd CE. Epidemiology of depression and diabetes: A systematic review. J Affect Disord 2012;142(Suppl):S8-21.
2. Semenkovich K, Brown ME, Svrakic DM, Lustman PJ. Depression in type 2 diabetes mellitus: Prevalence, impact, and treatment. Drugs 2015;75:577–87.
3. CDC. Diabetes and Mental Health. Centers for Disease Control and Prevention. 2018. Available from: https://www.cdc.gov/diabetes/managing/mental-health.html. [Last accessed on 2021 Mar 24].
4. Rathod S, Pinninti N, Irfan M, Gorczynski P, Rathod P, Gega L, *et al.* Mental health service provision in low- and middle-income countries. Health Serv Insights 2017;10:1178632917694350.
5. Mapanga W, Casteleijn D, Ramiah C, Odendaal W, Metu Z, Robertson L, *et al.* Strategies to strengthen the provision of mental health care at the primary care setting: An Evidence Map. PLoS One 2019;14:e0222162.
6. Gopalkrishnan N. Cultural diversity and mental health: Considerations for policy and practice. Front Public Health 2018;6:179.
7. Kozlowska O, Solomons L, Cuzner D, Ahmed S, McManners J, Tan GD, *et al.* Diabetes care: Closing the gap between mental and physical health in primary care. Br J Gen Pract 2017;67:471–2.
8. Sharma VK, Lepping P, Cummins AG, Copeland JR, Parhee R, Mottram P. The Global mental health assessment tool-Primary Care Version (GMHAT/PC). Development, reliability and validity. World Psychiatry 2004;3:115–9.
9. Sharma VK, Wilkinson G, Dowrick C, Church E, White S. Developing mental health services in a primary care setting: Liverpool Primary Care Mental Health Project. Int J Soc Psychiatry 2001;47:16–29.
10. Kruse J, Schmitz N, Thefeld W. On the association between diabetes and mental disorders in a community sample: Results from the German National Health interview and examination survey. Diabetes Care 2003;26:1841–6.
11. Sharma VK, Jagawat S, Midha A, Jain A, Tambi A, Mangwani LK, *et al.* The global mental health assessment tool-validation in hindi: A validity and feasibility study. Indian J Psychiatry 2010;52:316-9.
12. Teshome HM, Ayalew GD, Shiferaw FW, Leshargie CT, Boneya DJ. The prevalence of depression among diabetic patients in Ethiopia: A systematic review and meta-analysis, 2018. Depress Res Treat 2018;2018:6135460.
13. Bădescu S, Tătaru C, Kobylinska L, Georgescu E, Zahiu D, Zăgrean A, *et al.* The association between diabetes mellitus and depression. J Med Life 2016;9:120–5.
14. Huang C-J, Lin C-H, Lee M-H, Chang K-P, Chiu H-C. Prevalence and incidence of diagnosed depression disorders in patients with diabetes: A national population-based cohort study. Gen Hosp Psychiatry 2012;34:242–8.
15. Rahman MS, Akter S, Abe SK, Islam MR, Mondal MNI, Rahman JAMS, *et al.* Awareness, treatment, and control of diabetes in Bangladesh: A nationwide population-based study. PLoS One 2015;10:e0118365.
16. How diabetes impacts your mental health. Beyond Type 1. Available from: https://beyondtype 1.org/diabetes-impacts-mental-health/. [Last accessed on 2021 Mar 24].
17. Kalra S, Jena BN, Yeravdekar R. Emotional and psychological needs of people with diabetes. Indian J Endocrinol Metab 2018;22:696–704.
18. Lin EHB, Rutter CM, Katon W, Heckbert SR, Ciechanowski P, Oliver MM, *et al.* Depression and advanced complications of diabetes: A prospective cohort study. Diabetes Care 2010;33:264–9.
19. Weaver LJ, Mendenhall E. Applying syndemics and chronicity: Interpretations from studies of poverty, depression, and diabetes. Med Anthropol 2014;33:92–108.
20. Pamungkas RA, Chamroonsawasdi K, Vatanasomboon P. A systematic review: Family support integrated with diabetes self-management among uncontrolled type II diabetes mellitus patients. Behav Sci 2017;7:62.
21. Strom JL, Egede LE. The impact of social support on outcomes in adult patients with type 2 diabetes: A systematic review. Curr Diab Rep 2012;12:769–81.