ORIGINAL RESEARCH ARTICLE
pISSN09763325 | eISSN22296816
Open Access Article (CC BY-SA)
www.njcmindia.org
DOI: 10.55489/njcm.13052022423

Depression And Quality of Life Among Type-2 Diabetes Mellitus Patients: A Case Control Study

Suleman Shareef Mahammad[1], A Indira[2], Visweswara Rao Guthi[3], Alex Viji[4], G Aruna[5], Katari Kantha[6], J Jasmine[7]

[1]Lincoln University College & SVIMS, SPMCW, Petaling Jaya, Malaysia &Tirupati, Inida
[2]Narayana College of Nursing, Nellore, India
[3]SVIMS, SPMCW, Tirupati, India
[4,5,6]Narayana College of Nursing, Nellore, India
[7]Mother Theresa Post graduate and Research Institute of Health Sciences, Puducherry, India

ABSTRACT

Background: Diabetes is accompanied by a distinct decreased in subject's quality of life (QOL) and it shows to elevated disability-adjusted life years than most diseases. Depression shows the degrade QOL and is associated with wretched treatment outcomes and lesser the glycaemic control in diabetes. Objective of this study is to study the association between Quality of Life (QoL) and depression among type2 diabetes mellitus in Andhra Pradesh.

Methodology: This was a case control study. There were 300 participants including 150 type2 diabetes mellitus patients, &150 healthy individuals (age and gender matched) were also selected as a control to meet the purpose of the study. Subjects age range was set between 35-65 years. Beck depression inventory (BDI-II) and WHO quality of life scale (QOL BREF) were used for data collection, SPSS-26(v).

Results: The study findings showed that significant but negative relation between depression scores and quality of life.65% have Poor Quality of life & 57% have high depression in Diabetes Patients. 54% have good Quality of life & 78% have Mild Depression in Healthy Individuals.

Conclusion: It is concluded that association between depression and sub-scales of quality of life indicating that high depression scores may lead to lower physical and psychological health impacting social relationship and environmental health.

Key words: Quality of life, Depression, Diabetes Mellitus, Tertiary care hospital

INTRODUCTION

Diabetes Mellitus (DM) is a chronic disease of metabolic disorder characterized by hyperglycaemic condition resulting from defects in insulin secretion, insulin action or both[1].Type 2 DM is a common non-communicable disease. Prevalence increases with obesity. It is the predominant form of diabetes worldwide[2]. Globally 382 million people had DM in 2013. This number is expected to raise to 592 million by 2035.Most of the people with DM live in low- and middle-income countries[3]. WHO reported prevalence of DM among adults over 18 years of age has risen from 4.7 percent in 1980 to 8.5 percent in 2014. In 2012, an estimated 1.5 million deaths were directly caused by DM and another 2.2 million deaths are attributable to high blood glucose[4]. In North India, prevalence of type 2 DM in urban area was 18.7 per cent[5]and in rural area was 9.1 percent[6]. A study done in South India reported prevalence of DM was 12.11 percent[2].

How to cite this article: Mahammad SS, Indira A, Rao GV, Viji A, Aruna G, Katari K, Jasmine J. Depression and Quality of Life Among Type-2 Diabetes Mellitus Patients: A Case Control Study. Natl J Community Med 2022;13(5):319-326. DOI: 10.55489/njcm.13052022423

Financial Support: None declared | **Conflict of Interest:** None declared | **Date of Submission**: 17-03-2022 **Date of Acceptance**: 12-04-2022 **Date of Publication**: 31-05-2022

Correspondence: Mr. Suleman Shareef Mahammad (Email: shareef9293@gmail.com)

In various demographic regions of Andhra Pradesh, prevalence of type 2 DM was found (7.8%) in tribal's, (12.8%) in semi urban and (15%) in urban areas[7]. The following are the prevalence of type 2 DM in the districts Vishakhapatnam district (5%)[8], a study done in Nellore (Nellore district) (15%)[9] and Tirupati (Chittoor district) reported (12.4%)[10]. DM has caused approximately 4.6 million deaths in all age groups. 20-79 years accounting for approximately 8.2 percent of mortality. 80 percent of diabetic deaths occur in low- and middle-income countries[11].In adult's 90 percent have type II diabetes mellites, only 10 percent have type I diabetes mellitus reported[12].

Depression is commonly found as a comorbid condition in DM particular[13]. Globally, an estimated 280 million people of all ages suffer from depression. At its worst, depression can lead to suicide. Over 7,00,000 people die due to suicide every year[14]. In a review of 48 published articles representing 15 countries estimates the comorbid depression among people with DM was lowest (2%) in Brazil, highest (84%) in India[15]. In Northern India depression among patients with DM was found 41 per cent. A study in Southern India showed the prevalence of depression in patients with DM was 49 per cent[16]. The co-occurrence of the two dreaded diseases, namely depression and diabetes, as the two are frequently encountered together in routine clinical practice. Since two illnesses may affect each other[17]. Anyone can encounter depression at some time in life, that evidence claims that diabetic clients have more chances to experience depression[18].

The quality of life (QoL) in diabetic patients is defined as their subjective perception about life in terms of cultural characteristics, social beliefs and values, personal goals and expectations, patterns and concerns. It is well known that Quality of Life is multidimensional. Increasingly QoL assessment has been employed to evaluate outcome among patients with chronic medical conditions, and such chronic illnesses typically are associated with decreased QoL[19].

Measuring the impact of chronic disease on QoL of the patient is important because physiological measurements and laboratory parameters do not provide sufficient insight into the patient's psychological status and satisfaction, which in the perception of the patient may be more important than objective indicators[20].

Objective of this study is to study the association between Quality of Life (QoL) and depression among type2 diabetes mellitus in Andhra Pradesh.

MATERIALS AND METHODS

The present study is a case control study conducted at Outpatient department of endocrinology department in Narayana Medical College hospital, Nellore from December 2018 to May 2019 (6 months).

Selection of Sample: The 300 subjects were selected by using purposive sampling technique and divided into two groups i.e., case group (150 subjects) & Control group (150 subjects).

Cases are defined as those who are known and diagnosed diabetics and age in between 35-65 years, consuming Oral hypoglycaemic Agents (OHA)/ insulin and attended for endocrinology OP consider as cases (Type2 Diabetes Mellitus).

Controls are defined as those attended to endocrinology OPD during study period for other endocrine problems and with blood sugar levels within normal limits, not consuming Oral hypoglycaemic Agents (OHA)/insulin, which were age and gender matched with cases.

Inclusion criteria: All type2 Diabetic Mellitus patients and non-diabetic aged 35-65 years, and willing to participate in the study were selected.

Exclusion criteria: Those who were under treatment for chronic diseases and have known terminal or mental illness. Those who were not willing to participate in the study were excluded.

The subjects were approached individually after ethical permission obtained from the institution of Narayana College of Nursing, Nellore. Hospital authority's permission were taken for data collection from the patients attended to endocrinology OPD for comparison age and gender matched healthy individuals as a control included in the study. Informed consent was taken from the sample to collect the data and confidentiality of the subjects was maintained. The respondent was obtained. Guidelines of scale items were explained to participants. While queries were encouraged regarding unclear items.

Data collection: Socio demographic details demographics include age, gender, religion, marital status, educational status, occupational status, family type, living status, residence, monthly income, anthropometry (BMI), duration of the diabetes, type of diet, hospitalization and type of treatment were collected through a separate data sheet.

Depression: Beck depression inventory Il (BDI- II) scale was developed by Aron T beck in 1996. BDI- II is used for measuring depression. It is comprised on 21 items with scoring on Likert scale ranging from 0-3. It is used as self-report measuring of depression. The range of score 1-16 has low depression, range from 17-30 has moderate depression, 31-40 has severe depression and > 40 has extreme depression.

Quality of Life Scale: Quality of life of the subjects was evaluated through WHO QOL BREF. The WHO QOL scale contains 26 items. Items 3,4,10,15,16,17 and 25 represent physical health, items 5,6,7,11,18 and 26 are representative of psychological health, items 19,20,21 are indicative social health, items 8,9,12, 13,14,22,23 and 24 + 1 and 2 reflect the environmental health of the subjects.

Ethical Clearance:

The study protocol was approved by the Institutional Ethical committee, in Human subjects, Narayana College of Nursing, Nellore was obtained (File.No:02/PhD (N)/LU/2018 dated 6th June 2018).

Data analysis:

The collected data was entered into Microsoft excel. Number and percentages were calculated for qualitative data. Mean and standard deviations was calculated for quantitative data. Chi-square test was used to test significance for qualitative data. *Shapiro–Wilk test* was used to test the normality. If the data is normally distributed Student t test was used to test significance difference between 2 means. If the data is not normally distributed Mann Whitney's U test was used. Pearson correlation was used to test the correlation between 2 quantitative variables. SPSS version 26 was used to calculate statistics. P value <0.05 will be considered as significant.

RESULTS

The study was conducted among 300 individuals of which 150 type 2 diabetic patients and for the comparative control group of 150 healthy individuals (age and gender matched) were selected. The results demonstrate the negative co-relation between QOL and BDI-II and significant difference among type-II diabetic patients and healthy individuals.

From table 1, it is observed that majority of the patients had poor quality of life (65.3%) while among controls, (4.70%) had poor quality of life. Similarly, majority of the patient group (57.3%) had high levels of depression while only (6.0%) among controls showed such significant level of depression.

From table 2, it is observed that most of the patients had poor scores in physical domain (61.3%), psychological domain (60.0%) and in social domain (73.3%). In environmental domain majority of the patients (53.3%) were had moderate scores. Where as in controls majority were had good scores in physical domain (52.0%), psychological domain (57.3%), and social domain (56.6%) and in environmental domain (55.3%).

Table 3 shows that significant negative correlation was found between overall QoL and depression among type 2 DM patients as well as controls. A very significant inverse correlation has been observed linking depression and subscales of QoL indicating that high depression scores may lead to lower physical and psychological health impacting social relationship and environmental health. Results are statistically significant.

Table 4 shows that the mean quality of life score was found to be significantly lower in-patient group (57.2%) compared to that in control group (90.9%) (p<0.01; S).

Table 1: Distribution of overall QoL and Depression among type2DM patients and controls

Variables	Patients (n=150)	Controls (n=150)
Overall QOL		
Poor	98 (65.3)	7 (4.7)
Moderate	34 (22.7)	28 (18.6)
Good	18 (12)	81 (54)
Very Good	0 (0)	34 (22.7)
Depression		
Mild	41 (27.3)	112 (74.7)
Moderate	23 (15.3)	29 (19.3)
High	86 (57.3)	9 (6)

Figures in parenthesis indicate percentages.

Table 2: Distribution of QoL domain scores among type 2 DM patients and healthy controls

Variables	Patients (n=150)	Controls (n=150)
Physical domain		
Poor	92 (61.3)	11 (7.3)
Moderate	42 (28)	28 (18.7)
Good	16 (10.7)	78 (52)
Very good	0 (0)	33 (22)
Psychological domain		
Poor	90 (60)	6 (4)
Moderate	44 (29.3)	33 (22)
Good	16 (10.7)	86 (57.3)
Very good	0 (0)	25 (16.7)
Social domain		
Poor	110 (73.3)	16 (10.7)
Moderate	30 (20)	33 (22)
Good	6 (4)	85 (56.6)
Very Good	4 (2.7)	16 (10.7)
Environmental domain		
Poor	54 (36)	12 (8)
Moderate	80 (53.3)	24 (16)
Good	15 (10)	83 (55.3)
Very good	1 (0.7)	31 (20.7)

Figures in parenthesis indicate percentages.

Table 3: Correlation between domains of QoL and depression among type 2 DM cases and controls

Scales	Depression score			
	Cases (n=150)		Controls (n=150)	
	ϒ	P	ϒ	P
Overall QoL	-.617**	0.00	-.604**	0.00
Physical health	-.587**	0.00	-.547**	0.00
Psychological health	-.567**	0.00	-.558**	0.00
Social health	-.448**	0.00	-.587**	0.00
Environmental health	-.548**	0.00	-.605**	0.00

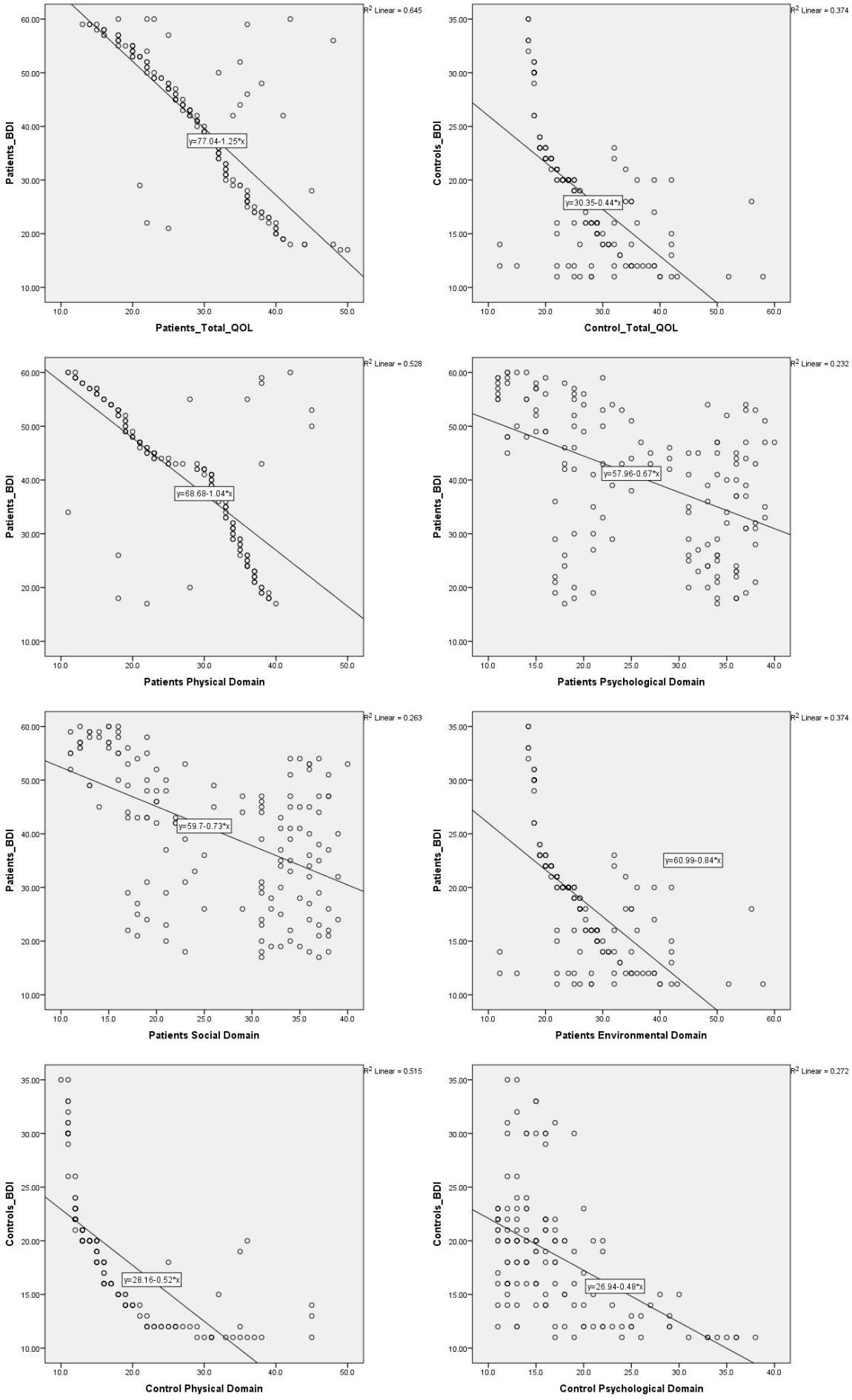
**correlation is significant at the 0.01 level (2 tailed)
*Correlation is significant at the 0.05 level (2 tailed)

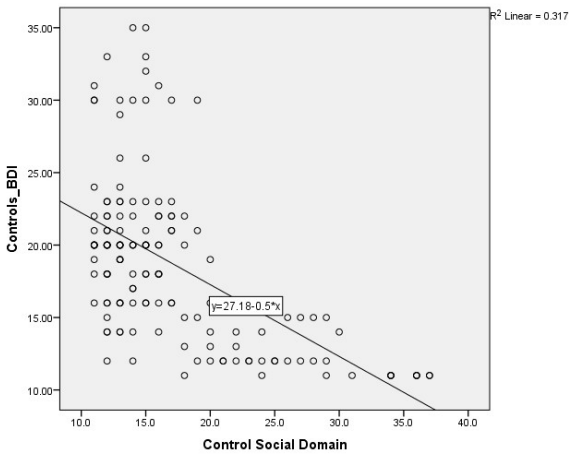
Table 4: Overall QoL, its domains and depression in type2 DM patients and healthy controls

Variables	Patients (n=150) Mean±SD	Controls (n=150) Mean±SD	P value
Overall QoL	57.27±12.91	90.92±17.80	0.000
Physical health	14.97±4.21	23.92±5.47	0.000
Psychological health	13.63±3.53	21.23±4.35	0.000
Social health	6.24±2.22	9.97±2.44	0.000
Environmental health	18.38±4.33	28.07±5.99	0.000
Depression	31.73±13.21	13.33±7.61	0.000

't' test applied for calculation of statistical significance.

Figure 1: Scatter plots between patients and controls depression scores and quality of life doamins





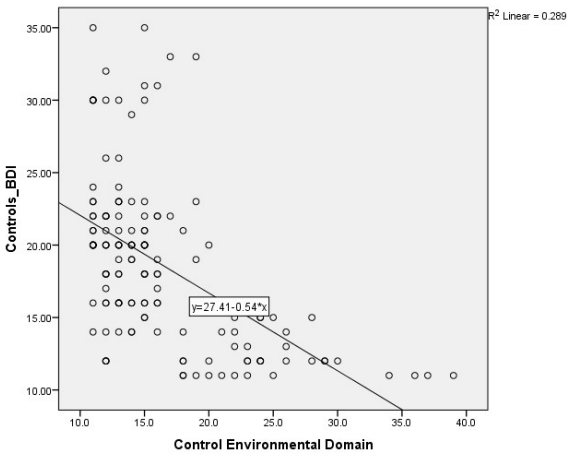


Table 5: Association between QoL with socio-demographic variables of type 2 DM patients

Variables	Quality of Life			χ2	P value
	Poor N (%)	Moderate N (%)	Good N (%)		
Gender					
Male	43 (62.3)	22 (31.9)	4 (5.8)	9.064	0.011
Female	55 (67.9)	12 (14.9)	14 (17.2)		
Educational status					
Illiterate	19 (95)	0 (0)	1 (5)	39.696	0.000
Upto10th	55 (77.5)	10 (14)	6 (8.5)		
Inter	5 (38.5)	5 (38.5)	3 (23)		
Degree	13 (32.5)	19 (47.5)	8 (20)		
Professionals	6 (100)	0 (0)	0 (0)		
Occupation					
Govt. employee	6 (16.7)	19 (52.7)	11 (30.6)	53.206	0.000
Private Employee	12 (75)	2 (12.5)	2 (12.5)		
Daily wage	19 (90.5)	2 (9.5)	0 (0)		
Self-employee	8 (100)	0 (0)	0 (0)		
Housemaker	53 (76.8)	11 (16)	5 (7.2)		
Residence					
Urban	72 (63.1)	24 (21.1)	18 (15.8)	6.574	0.037
Rural	26 (72.2)	10 (27.8)	0 (0)		
Monthly income					
Below10000	60 (84.5)	5 (7)	6 (8.5)	46.625	0.000
10000-20000	16 (59.2)	4 (14.8)	7 (26)		
20000-30000	8 (50)	6 (37.5)	2 (12.5)		
30000-40000	6 (46.1)	4 (30.8)	3 (23.1)		
Above40000	8 (36.3)	15 (68.1)	0 (0)		

All the sub-domains of quality of life like physical health, psychological health, social health and environmental health were found to be significantly lower in patients group compared to control group (p<0.01; S). The mean depression score was found to be significantly higher in-patient group (31.7%) compared to that in control group (13.3%) (p<0.01; S).

Form table 5 it is observed that there was a statistically significant association of gender and residence with respect to QoL at p< 0.05 level, educational status, occupational status and monthly income at p<0.01 level

Table6 shows that significant difference among living status, residence, PPBS values, marital status, educational status, occupational status, income status, BMI and HbA_1C with respect to mean scores of depressions.

DISCUSSION

The present study is a case control study to study the association between depression and Quality of Life among type 2 Diabetes Mellitus patients. In this study among type 2 diabetes mellitus patients 27.3% had mild depression and 15.3% had moderate depression. Similar distribution was observed by Bayani M A (2022).[21]when comparing both studies in our study type2 diabetes clients unaware of depression, due to low socio-economic status and more number of house makers in the study population. Depression among diabetes is common when compared to non-diabetic, because of life long treatment and self-care practices need to be practised. This may alter their daily routine and reduce their quality of life compared to non-diabetic population. While in other study conducted by K Mosaku et.al[22] (2008) only 20% of study population were having the depression.

Table 6: Comparison of means of depression among Socio-demographic variables

Demographic variables	N	Mean±SD	p-value
Living status			
With family	142	30.92±13.08	0.00#
Alone	8	46.13±4.48	
Residence			
Urban	114	30.19±13.26	0.01#
Rural	36	36.58±11.98	
PPBS Values			
Normal	29	26.21±14.06	0.00#
Above normal	121	33.05±12.71	
Marital status			
Married	138	31.02±13.07	0.01*
Single	2	34.5±26.16	
Divorced	1	13	
Widow	9	44±4.27	
Total	150	31.73±13.21	
Educational status			
Illiterate	20	37.55±13.83	
Up to 10^{th}	71	34.66±11.97	0.00*
Inter	13	25.85±13.32	
Degree	40	26.33±13.3	
Professionals	6	26.33±6.77	
Total	150	3.73±13.21	
Occupational status			
Govt. employee	36	18.92±7.77	0.00*
Private employee	16	32.38±11.18	
Daily wage	21	40.29±8.66	
Self-employee	8	40±8.6	
House maker	69	34.7±12.95	
Total	150	31.73±13.21	
Income			
Below 10,000	71	33.51±13.68	0.01*
10,000-20,000	27	33.33±13.44	
20,000-30,000	16	35.75±10.18	
30,000-40,000	13	22.08±12.43	
Above 40,000	23	27±10.7	
Total	150	31.73±1.21	
BMI			
Normal	38	27.71±15.26	0.04*
Above normal	60	31.62±12.33	
Obese	52	34.79±11.98	
Total	150	31.73±13.21	
HBA_1C			
Normal	10	14.7±5.83	0.00*
Increased	15	31.07±15.01	
Higher	125	33.17±12.5	
Total	150	31.73±13.21	

#t-test applied; *ANOVA

This may be due they are aware of depression and it can help to decline the stress and anxiety related to disease.

A systematic review which was conducted to study the association of depression and type 2 diabetes observed that depression is associated with a 60% increase in the risk of developing type 2 diabetes.[23]In another systematic review to assess the prevalence of clinical depression in type 2 diabetes, it was found that the prevalence was significantly higher among patients with type 2 diabetes (17.6%) compared to those without diabetes (9.8%). [24]Similarly, a study among Greek adult population observed that elevated depressive symptoms in 33.4% of the type 2 diabetes population.[25] Similar findings were observed in studies done in South East Asia as well. In Bangladesh, a population-based study showed depressive symptoms among 29% of men and 30.5% of women who were newly diagnosed with type 2 diabetes.[26] In a similar study in Pakistan in a rural area reported depression prevalence of 14.7% in type 2 diabetic people.[27] In India, hospital studies have documented that the prevalence of depression among type 2 diabetic patients ranges from 8.5% to 32.5% with various scales.[28] These findings were similar to this study. Hospital-based studies in Nepal reported that high prevalence of depression among type 2 diabetic patients of 40.3%, 44.1% and 54.1%.[28-30]These findings were high compared to this study may be due to using different scales to assess the depression and different age groups of study population. These findings are may be due to rural back ground of the diabetic population, population living alone leads to lack of support from the family members to take care themselves and low income among daily wage labourers.

About 12% of Type2 DM clients had good QoL, however which was higher findings in these studies (55%) done by Raghavendra N et.al (2017)[31], (39.2%) done by Mahammad S.S[32](2022) and (21%) done by Alshayban D (2020).[33]Type2 DM Patients had 22.7% of moderate QoL, however which was higher findings observed in this study (28.6%) Raghavendra N et.al (2017)[31], (60%) done by Mahammad S.S(2022)[32], and (51%) done by Alshayban D (2020).[33]Majority of the Type2 Diabetes Mellitus had 65.3% poor Quality of Life, however which was lower in these studies done by (0.8%) done by Mahammad S.S[24] (2.9%) Raghavendra N et.al (2017)[23] and (28%) Alshayban D (2020).[33]It is well-known that diabetes is a metabolic disorder this will have debilitation of quality of life same manner in our study also happened due lack support of family members and poor education status and low socio economic status also are also reasons in the society.

The lowest Mean & SD score in Physical domain 14.97±4.21, Psychological domain 13.63±3.53, Social domain 6.24±2.22, Environmental domain 18.38±4.33 & Overall QoL 57.27±12.91. However, which was higher findings observed in this study done by Enang et.al (2021).[34]

Over all high Mean & SD score in depression was 37.13±13.21. However, which was lower findings observed in this study 12.82±9.46 Altınok, et al (2016).[35]The survey shows that male population have 46% and in educational status secondary education have 47.3%. While showing similar distribution in 52.7% of male population and 80% of educational status study done by Enang et.al (2021).[34]In this study 46% of House makers, 92% of married & 76% & of urban residence population. While in this study conducted by Sharma et.al (2019) higher findings 67% of unskilled employment & lower findings in married 58.5%, rural residence 75.4%.36

In this study it showed that there was negative corelation (ʏ) between quality of life and depression in all domains, -0.587 of Physical Domain, -0.567 of Psychological Domain, -0.448 of Social Domain, -0.548 of Environmental Domain. Similar findings were observed in all domains, -0.77 of Physical Domain, -0.61 of Psychological Domain, -0.76 of Social Domain, -0.67 of Environmental Domain study done by Cakmak et al (2020).[37]

In this study and other studies, it is observed that, there is high level of depression among type2 diabetes mellitus subjects, and it has serious effect on diabetes results and quality of life also. Most of the urban population due to busiest life they are unable to look about their health. It is suggested that regular physician appointment in terms of physical problems, mental problems and quality of life also should also be more contemplate. Daily psychiatrist visits for examining psychological disorders will make early diagnosis to give treatment for that.

ACKNOWLEDGMENT

The authors acknowledge the suggestions of Dr. K.V.S. Sharma, Statistician, Rtd. Prof. and Principal, SVU college of Arts, S V University.

CONCLUSIONS

It is concluded from this study that association of depression and sub-scales of quality of life indicating that high depression scores may lead to lower physical and psychological health impacting social relationship and environmental health.

REFERENCES

1. Ozougwu JC, Obimba K.C, BelonwuC.D and UnakalambaC.B.The pathogenesis and pathophysiology of type 1 and type 2 diabetes mellitus. Journal of physiology and pathophysiology 2013;4:46-57.https://doi.org/10.5897/JPAP2013.0001ISSN 2I41-260X © 2013 Academic Journals http://www.academicjournals.org/JPAP
2. Monika Gupta, K. Prabhu, B.O. Parijatham, V.S. Kalaiselvi, S.M. Rajendran, Jamila Rose Prevalence of Diabetes Mellitus in South India: A Retro spective Analysis. JIMSA. 2012 Oct;25(4):239-240.
3. Guariguata 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 Pract 2014; 103:137-49.PMID: **24630390**: DOI: https://doi.org/10.1016/j.diabres.2013.11.002
4. Global report on diabetes. World Health Organisation, Geneva 2016. Available at: https://www.who.int/publications/i/item/9789241565257.
5. Mandal A.Study of prevalence of type 2 diabetes mellitus and hypertension in overweight and obese people.J Family Med Prim Care 2014;3:25-28. PMCID: PMC4005195, PMID: 24791232.doi: 10.4103/2249-4863.130265
6. Rathod, HetalK & Banerjee, Amitav & Bhawalkar, JitendraS & Chitnis, UdayB & Darade, SanjayS & Jadhav, SudhirL. (2014). Rural prevalence of type 2 diabetes mellitus: A cross sectional study. Journal of Social Health and Diabetes. 2. 82. https://doi.org/10.4103/2321-0656.130792.
7. Vijaya Nirmala P, Gudivada M., Vijaya Lashmi.C. Comparative Study of the Prevalence of Type-2 Diabetes Mellitus in Various Demographic Regions of Andhra Pradesh, India: a Population based Study.International Journal of MCH and AIDS 2016;5:103-11.PMID: **28058197**PMCID: PMC5187642DOI: https://doi.org/10.21106/ijma.91
8. S Manjubhashini, P J Srinivas. Screening for diabetes melllitus and its risk factors in a rural village of Visakhapatnam district, Andhra Pradesh. Int J Med Sci Public Health. (2014), [cited February 20, 2022]; 3(12): 1551-1555. doi:10.5455/ijmsph.2014.240820141
9. Indira S. A study to assess the prevalence of diabetes mellitus among people attending OPD in Narayana Medical College and Hospital, Chinthareddypalem, Nellore. Narayana Nursing Journal 2013;1:3-4. Available at: https://www.bibliomed.org/mnsfulltext/157/157-1464849833.pdf?1648730775
10. Govindu S, Gopi Krishna B, Ravi Prabhu G.Prevalence of diabetes mellitus and its association with life style factors among adults in Tirupati, Andhra Pradesh.International Archives of Integrated Medicine 2015;2:10-7.Available at:http://www.iaimjournal.com/wp-content/uploads/2015/05/3-Prevalence-of-diabetes-mellitus.pdf
11. Melba Sheila D'Souza, Ramesh Venkatesaperumal, Susan D. Ruppert, Subrahmanya Nairy Karkada, Devakirubai Jacob, "Health Related Quality of Life among Omani Men and Women with Type 2 Diabetes", Journal of Diabetes Research, vol. 2016, Article ID 8293579, 10 pages, 2016. https://doi.org/10.1155/2016/8293579
12. Lee Goldman, Dennis Ausiella. Cecil. Textbook of medicine.2004;2:1425.
13. Gemeay EM, Moawed SA, Mansour EA, Ebrahiem NE, Moussa IM, Nadrah WO. The association between diabetes and depression. Saudi Med J. 2015 Oct;36(10):1210-5. doi: 10.15537/smj.2015.10.11944. PMID: 26446333; PMCID: PMC4621728.
14. WHO fact sheet on global burden of Depression N°369,2021. Available at: https://www.who.int/news-room/fact-sheets/detail/depression
15. Mendenhall E, Norris SA, Shidhaye R, Prabhakaran D.Depression and Type 2 Diabetes in Low and Middle Income countries: A Systematic review.Diabetes Res Clin Pract 2014;103:276-85. https://doi.org/10.1016/j.diabres.2014.01.001. PMID: 24485858; PMCID: PMC3982306
16. Madhu M, Abish A, Kuriakose A,Jophin RI, Kiran AM,Vijayakumar K. Predictors of depression among patients with diabetes mellitus in Southern India.Asian J Psychiatry 2013;6:313-7. doi: 10.1016/j.ajp.2013.01.012. Epub 2013 Mar 6. PMID: 23810139.
17. Girish Banwari. Comorbid depression and diabetes mellitus; A double whammy. NHL Journal of Medical Sciences. 2013; 2(2): 9-13. Available at: https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.403.6139&rep=rep1&type=pdf
18. Akhtar Bibi, Uzma M, Sana D, Samia B. relationship between quality of life and depression among DM patients of Rawalpindi, Pakistan. International journal of rehabilitation. 2013: 2: 10-16. Available at: file:///C:/Users/share/Downloads/Akhter-bibi1.pdf
19. Somappa HK, Venkatesha M, Prasad R. Quality of life assessment among type 2 diabetic patients in rural tertiary centre. International Journal of Medical Science and Public Health 2014;3:415-417. DOI: 10.5455/ijmsph.2014.260120143
20. Gavric Z and Vujmilovic DG. Perceptions of Psychological Domain of Quality of Life in Patients with Diabetes Mellitus. Open Journal of Preventive Medicine 2014;4:489-498.DOI:

10.4236/ojpm.2014.46057

21. Bayani M A, Shakiba N, Bijani A, Moudi S. Depression and quality of life in patients with type 2 diabetes mellitus. Caspian J Intern Med. 2022; 13 (2) :3-0. Available at: URL: http://caspjim.com/article-1-2560-en.html
22. Kolawole Mosaku, Babatope Kolawole, Celestine Mume, Rosemary Ikem. Depression, Anxiety and Quality of Life among Diabetic Patients: A Comparative Study. Journal of the National Medical Association. .2008:100(1). 73-8. https://doi.org/10.1016/S0027-9684(15)31178-0.
23. Mezuk B, Eaton WW, Albrecht S, Golden SH. Depression and Type 2 Diabetes Over the Lifespan. Diabetes care. 2008;31(12):2383–90.doi: 10.2337/dc08-0985. PMID: 19033418; PMCID: PMC2584200.
24. Ali S, Stone MA, Peters JL, Davies MJ, Khunti K. The prevalence of co-morbid depression in adults with Type 2 diabetes: a systematic review and meta-analysis. Diabet Med. 2006;23:1165–73. Available from: http://www.ncbi.nlm.nih.gov/pubmed/17054590 pmid:17054590
25. Sotiropoulos A, Papazafiropoulou A, Apostolou O, Kokolaki A, Gikas A, Pappas S. Prevalence of depressive symptoms among non insulin treated Greek type 2 diabetic subjects. BMC research notes. 2008;1:101. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2590605&tool=pmcentrez&rendertype=abstract pmid:18957113
26. Asghar S, Hussain A, Ali SMK, Khan AKA, Magnusson A. Prevalence of depression and diabetes: A population-based study from rural Bangladesh. Diabetic Medicine. 2007;24(8):872–7. pmid:17403122
27. Zahid N, Asghar S, Claussen B, Hussain A. Depression and diabetes in a rural community in Pakistan. Diabetes Research and Clinical Practice. 2008;79(1):124–7. pmid:17692423
28. chaudhry R, Mishra P, Mishra J, Parminder S, Mishra BP. Psychiatric morbidity among diabetic patients: A hospital-based study. Industrial psychiatry journal. 2010;19(1):47–9. pmid:21694791
29. Niraula K, Kohrt B a, Flora MS, Thapa N, Mumu SJ, Pathak R, et al. Prevalence of depression and associated risk factors among persons with type-2 diabetes mellitus without a prior psychiatric history: a cross-sectional study in clinical settings in urban Nepal. BMC psychiatry .2013;13:309. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3833646&tool=pmcentrez&rendertype=abstract pmid:24238561
30. Joshi S, Dhungana RR, Subba UK. Illness Perception and Depressive Symptoms among Persons with Type 2 Diabetes Mellitus: An Analytical Cross-Sectional Study in Clinical Settings in Nepal. Journal of diabetes research. 2015;2015:908374. Available from: http://www.mendeley.com/research/illness-perception-depressive-symptoms-among-persons-type-2-diabetes-mellitus-analytical-crosssectio/ pmid:26236749
31. Raghavendra N, Viveki RG, Gadgade A. An observational study to assess the health-related quality of life of type 2 diabetes mellitus patients attending a tertiary care hospital, Belagavi. Int J Community Med Public Health. 2017;4:3347-53. DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20173843
32. Suleman Shareef Mahammad, Armugham Indira, Amiya Bhaumik , Smitha P.M. , T Usha Kiran , P Navya Keerthana , Ruma Poddar , Bibi Florina Binti Abdullah , Regidor III Dioso. Quality of Life Among Type Two Diabetes Mellitus Clients in an Urban Area of TirupatiMalaysian Journal of Medicine and Health Sciences, 2022, 18, pp. 250–255.https://medic.upm.edu.my/upload/dokumen/20220126 14535146_1254.pdf
33. Alshayban D, Joseph R. Health-related quality of life among patients with type 2 diabetes mellitus in Eastern Province, Saudi Arabia: a cross-sectional study. PLoS One. 2020 Jan 10;15(1):e0227573.https://doi.org/10.1371/journal. pone.0227573
34. Ofem Enang, Ogban Omoronyia, Udeme Asibong, Agam Ayuk, Kenneth Nwafor and Annette Legogie.A case-control study of pattern and determinants of quality of life of patients with diabetes in a developing country. Journal of the Egyptian Public Health Association (2021) 96:2:1-11.https://doi.org/10.1186/s42506-020-00061-y
35. Altinok A, Marakoğlu K, Kargın NÇ. Evaluation of quality of life and depression levels in individuals with Type 2 diabetes. J Family Med Prim Care 2016;5:302-8. doi: 10.4103/2249-4863.192358. PMID: 27843832; PMCID: PMC5084552.
36. Preeti Sharma, Santosh Kumar, C.S. Sharma, Vidhata Dixit, Harsh Rathi, Viddur Arya. Assessment of depression in patients of type-2 diabetes mellitus attending a tertiary care centre. International Journal of Contemporary Medical Research 2019;6(6):F9-F14. DOI:http://dx.doi.org/10.21276/ijcmr.2019.6.6.10
37. Soner Cakmak1 , Emirhan Gen. Relationship between quality of life, depression and anxiety in type 1 and type 2 diabetes. Dusunen Adam The Journal of Psychiatry and Neurological Sciences 2020;33:155-169. DOI:10.14744/DAJPNS.2020.00075