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The Incidence of Depression among Patients with Type 2 Diabetes

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ABSTRACT

One of the most prevalent and severe mental illnesses among individuals with diabetes mellitus is depression. Studies showed that depression is a common comorbid condition in patients with diabetes mellitus. The existence of depression in diabetic patients is associated with the burden of complications, financial stress, poor overall health status, knowledge of diabetes and poor glycemic control. It also makes diabetes worse, increases noncompliance with medication, lowers quality of life, takes longer to recover from diabetes, and raises mortality. Major risk factors for hospital admissions and problems associated to diabetes include depression. ***Materials and Method*:** A prospective observational study carried out in the inpatient and outpatient department of General Medicine of a tertiary care teaching hospital. Data were collected from 141 patients with type 2 DM. A collection of standard tools, PHQ-9 (for detecting depression) and data collection forms were used. The statistical analysis including chi square test were performed using SPSS version 16. The study will be conducted for a period of 6 months. ***Result*:** The prevalence of depression within diabetic patients was discovered to be 69.5%. The comparison between factors viewed significant result with age (p=0.009), family history (p=0.001), duration of DM (p=0.001), blood sugar level (p=0.011), presence of diabetic complications (0.008) and presence of hypoglycemic event in last 3 months (p=0.004). However, factors like gender, BMI, marital status, and occupation were not significant. The management of DM and depression were analyzed along with presence of drug interaction. The notable result is that only 26% of the depressive patient sought treatment. ***Conclusion*:** Among study participants with diabetes mellitus, depression was quite prevalent. Individuals with diabetes mellitus showed varying degrees of depression. This could be linked to psychological issues, physical ailments, and trouble following the prescribed course of treatment. Patients with diabetes mellitus for more than five years, married individuals, and female responses had higher probabilities of depression.Thus, it is imperative that diabetic patients undergo a comprehensive screening process to detect this comorbid illness, and they must receive collaborative therapy for both diabetes and depression. Counselling should be also implemented to enhance treatment adherence, and mechanism to handle stressful life events.

Keywords: depression in diabetes, comorbid depression, risk factors, duration of diabetes, complications of diabetes

INTRODUCTION

Diabetes mellitus (DM) is a serious worldwide public health issue that is sharply rising in developing countries [1]. An estimated 200 million individuals worldwide are expected to have diabetes mellitus (DM), accounting for about 5% of the adult population worldwide [2]. Several factors contribute in T2DM pathogenesis, including environmental and lifestyle factors, positive family history, ethnicity and genetics [3] [4] [5]. Depression, anxiety, tension, and stress are among the numerous other problems that come with diabetes mellitus (DM), although they are frequently underdiagnosed. Patients with diabetes, especially women, had double to triple times higher rates of depression than the general population or groups with lower socioeconomic level [6][7].

Remarkably, a number of research indicate a reciprocal link between depression and diabetes [8] [9]. That is, people with diabetes had a higher chance of developing depression, and those with depression rather than those without the disease had a higher lifetime risk of developing diabetes. Nevertheless, various theories are being put forth, although it is unknown what the causal element and the outcomes. Research have shown that one of the main risk factors for the development of depression in diabetes patients is the biochemical alterations that result in hyperglycemia and/or hyperinsulinemia and their effects [10].

Depression is a comorbidity of diabetes that is linked to a lower quality of life in addition to a higher risk of death, less medical adherence, poor diet, a sedentary lifestyle, and a lower level of physical and mental wellness. This is similar to what happens with other chronic diseases. According to a study based on the global Burden of Disease studies, depression and diabetes were the primary causes of years spent disabled [11]. It is noteworthy to emphasize the concerning underdiagnosis of depression in diabetic patients, given that between two thirds and three quarters of these people receive no therapy from primary care physicians. One cause could be that psychiatric disorders are often undervalued by medical experts as well as by patients, which results in inadequate care [12].

Insulin sensitivity and glucose regulation be improved by dopamine [13]. Research indicates that treating type 2 diabetes mellitus and comorbid depression together is more efficient when done as part of an integrated approach [14]. Antidepressant medication, like selective serotonin reuptake inhibitors (SSRIs), works well as a medication [15]. Bupropion, a dopamine reuptake inhibitor, also appears to function in T2DM exactly as well as SSRIs [16].

SCOPE OF THE STUDY

When diabetes and depression coexist, there are serious health consequences, including poor health outcomes, a lower quality of life, reduced productivity, and a higher chance of mortality. Regarding the negative correlations found between depression and diabetes, there are still unanswered questions about causation. According to epidemiological research, depression raises the likelihood of developing diabetes, and diabetes raises the risk of developing depression in the future. Because depressed symptoms affect exercise levels and other health behaviours, it has been suggested that they operate as mediators of future metabolic disturbances.

Since the effects of depression and diabetes aggravate each other, comorbid conditions pose a serious threat to public health. Both have a major effect on life quality, yet it's unclear exactly how these two chronic illnesses interact with one another. It has long been neglected how important it is to evaluate the psychological health and quality of life of those who live with depressed diabetes patients, particularly in underdeveloped nations. Evaluating the quality of life of people with chronic diseases has grown in importance in recent years.

ETHICAL CONSIDERATION

The study title and protocol were approved by the institutional ethics committee (No. IEC 167/PD5/2019/P 08). The study conducted after obtaining the institutional ethical committee clearance. The written informed consent form is taken from the patient after the patient is informed about the study orally. No interventions have done without interviewing the patients and collecting the information from the hospital case record.

OBJECTIVES

- To evaluate the prevalence of depression in Type 2 diabetes mellitus patient.
- To identify the related factors of depression among the patients with diabetes.
- To analyze the management given by prescription analysis.
- To assess possible drug-drug interactions

RESEARCH METHODOLOGY

A prospective observational study will be carried out in the inpatient and outpatient department of General Medicine in a tertiary care teaching hospital. The study will be carry out to find the prevalence of depression in diabetic patient and its management. The study will be performed for a period of 6 months.

Study design:

It is a Prospective observational study carried out to analyze the prevalence of depression in type 2 DM patients and its management in a tertiary care hospital.

Study period:

The study was executed from the period of October 2023 to March 2024.

Study area:

The study was a single centered study at General medicine department in a hospital located in Malabar area of Kerala state.

Sample size:

A total of 141 patients were enrolled in the study.

Variables:

- Age
- Gender
- Body mass index (BMI)
- Family history
- Severity of depression
- Blood glucose level
- Duration of diabetes mellitus
- Hypoglycemic events
- Complications of diabetes mellitus
- Drug interaction

Sample size calculation:

A total of 141 patients were enrolled in the study, It is calculated by statistical equation:

Sample size for infinite population

$$S=Z^2 P (1-P)/M^2$$

Study Criteria:

Inclusion Criteria:

- Patients with age more than 18 years.
- Patients diagnosed with T2DM for more than 1years.

Exclusion Criteria:

- Patient with T1DM mellitus and Gestational Diabetes mellitus.
- Patients who have family history or diagnosed with psychiatric illness and depression before diagnosing diabetes mellitus.
- Patients with co-morbid conditions.
- Critically ill patient who could not respond

Data collection sources:

- Data was collected using a data entry form.
- By reviewing the patient's treatment chart & case sheets
- Patient interview (PHQ-9 Depression questionnaire).
- Interrogation with the bystander.
- By analysing prescription of doctor.
- Drug interaction checkers

- ✓ Drug.com
- ✓ Medscape
- ✓ Clinirexinfo
- ✓ Stockleys textbook of drug interactions

Study procedure:

In this prospective observational study diabetic patients with more than 1 years of disease were randomly selected. By using PHQ-9 Questionnaire form with structured data collection form, the patients will be interviewed. Patient demographic factors such as age, gender, occupation, marital status, BMI, duration and its treatment and past medical history were collected. Lab investigations such as blood glucose level were assessed. The prescription pattern and possible drug-drug interactions in these patients will be analysed. The criterion for inclusion and exclusion listed here will be used to choose the patients.

Data analysis:

Individual variables were expressed as percentages and statistical techniques such as chi square test were used to evaluate the difference. Statistics were performed using SPSS version 16. The results were considered significant when p value < 0.05.

RESULTS & DISCUSSION

The prospective observational study with total of 141 patients with diabetic history (T2DM) of more than 1 years was aimed to determine the occurrence of depression among them. The patient details were collected using the data collection form and diabetic associated depression was assessed with the help of Patient Health Questionnaire-9 (PHQ-9) according to the grounds of inclusion and exclusion. The statistical analysis of the study was conducted using MS Excel and SPSS software. The research also targeted to identify potential association among depression and different factors such as age group, sex, marital status, occupation, family history, blood sugar level, duration of DM, and hypoglycemic events experienced recently. According to certain research, there may be a reciprocal relationship between diabetes and depression [17]. The relationship between depression and incident type 2 diabetes risk has several possible explanations. Firstly, melancholy may raise the likelihood of acquiring type 2 diabetes via physiological alterations, such as immune system and hypothalamic-pituitary-adrenal axis activation, which opens the door for type 2 diabetes development. Secondly, comparable environmental variables such as early adversity experiences and socioeconomic deprivation were employed in the unification of depression and type 2 diabetes. Third, unhealthy habits including smoking, inactivity, and consuming large amounts of alcohol and calories were common among depression patients. The possibility of diabetes was frequently raised by these bad lifestyle choices.

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Variables	Class		PHQ Score		Total	p-value
			No Depression	Depression		
Age	**Young Adult (17-30)**	**N**	0	1	1	0.009*
		%	0.0%	100.0%	100.0%	
	Middle age Adult (31-45)	**N**	11	7	18	
		%	61.1%	38.9%	100.0%	
	Old Adult	**N**	32	90	122	
		%	26.2%	73.8%	100.0%	
Gender	**Female**	**N**	22	52	74	0.490
		%	29.7%	70.3%	100.0%	
	Male	**N**	21	46	67	
		%	31.3%	68.7%	100.0%	
Marital Status	**Married**	**N**	42	98	140	0.305
		%	30.0%	70.0%	100.0%	
	Unmarried	**N**	1	0	1	
		%	100.0%	0.0%	100.0%	
BMI	**Underweight**	**N**	1	0	1	0.106
		%	100.0%	0.0%	100.0%	
	Normal	**N**	16	28	44	
		%	36.4%	63.6%	100.0%	
	Overweight	**N**	21	44	65	
		%	32.3%	67.7%	100.0%	
	Obese	**N**	5	26	31	
		%	16.1%	83.9%	100.0%	
Occupation	**Working**	**N**	22	54	76	0.401
		%	28.9%	71.1%	100.0%	
	Non-Working	**N**	21	44	65	
		%	32.3%	67.7%	100.0%	
Family Diabetic History	**Negative**	**N**	22	11	33	0.001*
		%	66.7%	33.3%	100.0%	
	Positive	N	21	87	108	
		%	19.4%	80.6%	100.0%	
Blood Glucose Level	**FBS**	N	13	18	31	0.011*
		%	41.9%	58.1%	100.0%	
	FBS+PPBS	N	2	9	11	
		%	18.2%	81.8%	100.0%	
	FBS+RBS	N	0	6	6	
		%	0.0%	100.0%	100.0%	
	FBS+RBS+PPBS	N	1	0	1	
		%	100.0%	0.0%	100.0%	
	PPBS	N	5	2	7	
		%	71.4%	28.6%	100.0%	
	RBS	N	21	63	84	
		%	25.0%	75.0%	100.0%	
	RBS+PPBS	N	1	0	1	
		%	100.0%	0.0%	100.0%	
Duration of diabetes	**1-3 Years**	N	19	8	27	0.001*
		%	70.4%	29.6%	100.0%	
	3-5 Years	N	12	11	23	
		%	52.2%	47.8%	100.0%	
	>5 Years	N	12	79	91	
		%	13.2%	86.8%	100.0%	
Total		N	43	98	141	
		%	30.5%	69.5%	100.0%	

*p-value<0.05 is significant

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Sociodemographic characteristics:

The study population was classified into three. From those study it was concluded that prevalence of depression was higher in old adult (>45). The result was consistent with study conducted by Firoj et al [18][19][20][21]. The results of the study were significant (p=0.009). Claims of a higher prevalence of depression with increase in age suggest that there are many potential mediators contributing to and modulating depression. The three main causes of depression in older people can be poor physical health, social isolation and loss.

The current study identified that depression was not specifically associated with sex (p=0.490). However Female participants had more depression. The result was similar for study conducted by Habtamu et al [22][20][23].One possible explanation for the greater level of depression among female participants might be several socioeconomic variables, including educational and career prospects, livable incomes, healthy eating choices, societal norms and attitudes, and gender discrimination. In addition, females may be more susceptible to depression due to changes in sex hormones that occur at different stages of their life [22].

The study also analyzed the connection between BMI and depression. The results were not significant (p=0.106). These results were contradictory to the study conducted by Surabhi et al [19]. To investigate potential reasons for the link and the direction of causal relationships between depression and BMI, longitudinal and experimental research are required.

The respondents were mostly married (99.3%) and depression were most common in them. The results of the study were not significant (p=305) since almost all participants were married. However, a study done by Adane Asefa et al [24][21][25] found that being unmarried higher the risk of depression. Individuals who are married may receive psychological and social support, which aids in their depressive recovery.

It is also worthwhile to note that the study did not find significant (p=0.401) association between occupation and depression among participants [26][27][25]. But several other studies have also shown incongruous result [12]. Explanations for the discrepancy in results are not well understood. It may be due to poor quality of life associated with unemployment [28]. Unemployment and low income house hold were the most vulnerable groups for depression.

Family history of diabetes mellitus plays a vital role in developing depression. The results found were significant (p=0.001) suggesting that family history of the patient can contribute to developing of depression. These results were in concordance with a study conducted by Firoj Al Mamun et al [27][29][30]. The exact relationship of family history of DM and depression is unknown but a significant relationship can be established [31].

Prevalence and severity of the depression:

The prevalence of depression in the present study was revealed that 69.5% (n=141). The result was consistent with the study conducted by Aninda Debnath et al (68.2%) [32][28].

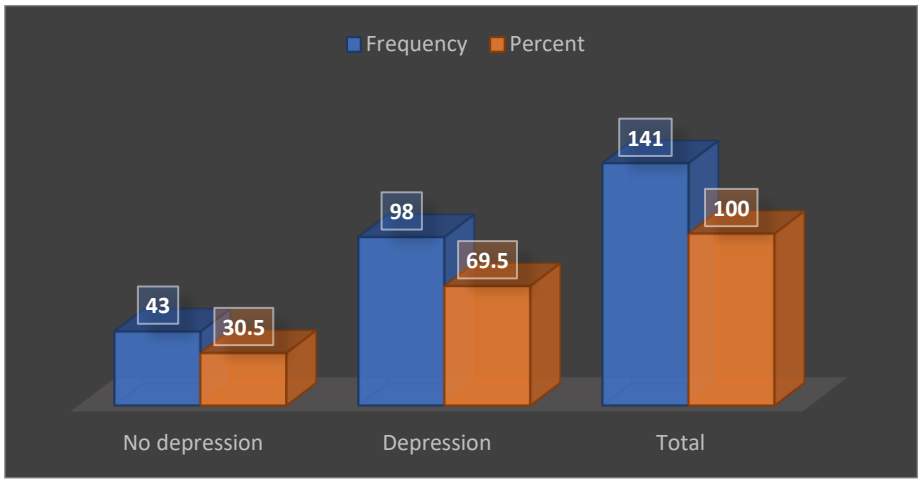

Figure 1: Total prevalence of depression among population

There are several reasons for the higher frequency of depression amid diabetic patients than in the overall population. The severity of the depression was assessed using Patient Health Questionnaire 9 (PHQ 9). Thereby concluded that depression was highly prevalence patient with type 2 Diabetes mellitus.

Specifically, the prevalence varies from minimal depression to severe depression. With moderate depression showing highest prevalence.

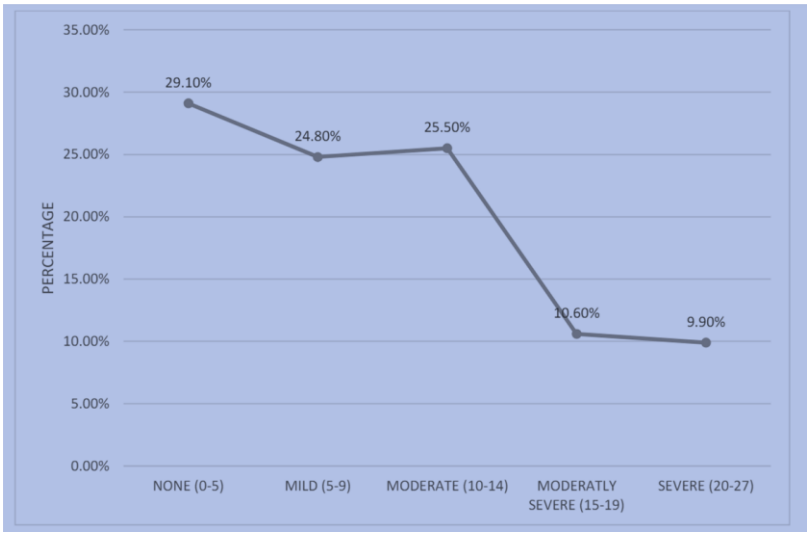

Figure 2: Categorization based on severity of depression among total population

Due to a lack of regular check-ups and mental health specialists in the healthcare facilities, it is feasible that many diabetes patients experience some level of depression, despite the high overall occurrence of depression in this research [25]. The results shows that the extend of depression is consistent with socio demographic factors of patients.

Duration of DM had significant impact on development of depression (ρ= 0.001). Patients who had DM for > 5 years. Showed higher prevalence. The results show a linear trend between the duration and depression. Similar results were revealed in study conducted by Seid Yimam et al [30] [19]. These results Points out that the duration of DM for >5 years increases the likelihood of depression occurrence 2-6 times [33] [34].

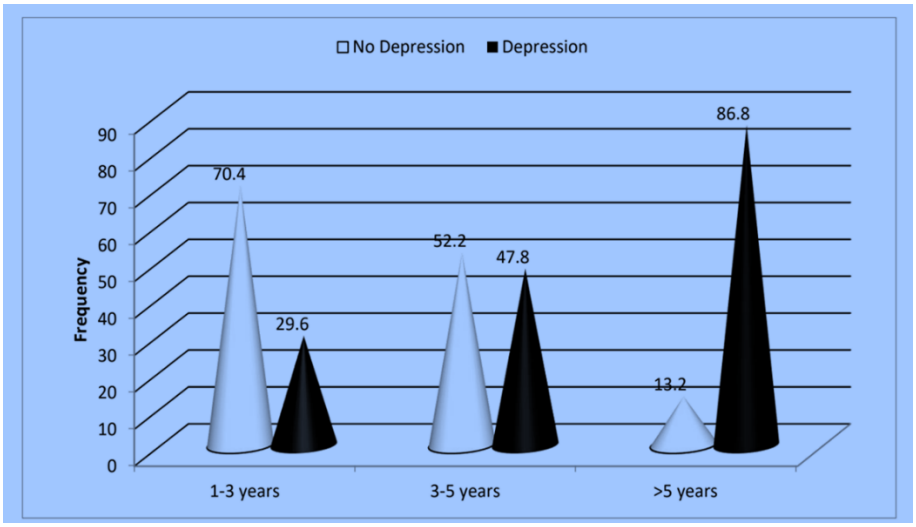

Figure 3: Categorization based on duration of DM among total population.

Since blood sugar levels is an important parameter for monitoring DM, it was compared with prevalence of depression. The result shows positive significant correlation (p=0.011). The study done by Surabhi Pandit et al revealed that there was a positive correlation of depression with blood sugar levels [19][35][36].

Clinical complications of DM were associated with development of depression. The study found significant results (p=0.008) when presence of complication was associated with development of depression. Studies has revealed that those who were experiencing retinopathy and diabetic foot were more likely to possess symptoms of depression [25] [37]. Other studies concluded that nephropathy and neuropathy were also associated with depression [27]. This concludes that there is significant and consistent association between diabetic complications and depressive symptoms [38] [19].

The study also analyzed hypoglycemic event among patients in the past 3 months. The results obtained were significant (ρ=0.004). The study tells that these events were experienced mostly by mild or moderate depressive patients. Several studies revealed that taking medications for a long time, multiple medications and receiving insulin as a treatment increased the chance of having depression [39]. These results could explain the connection of hypoglycemic events with depression.

Management and prescription analysis

Management given for diabetic patients were OHA, insulin along with dietary control. A DM friendly diet was followed by every patient. Most prescribed treatment were OHA when compared with insulin. The most convenient treatment for DM was identified to be OHA because the implementation of insulin therapy requires painful injections and frequent glucose measurement [27] [40].

Even though about 70% prevalence of depression was detected to be only 18.4 % of respondents were receiving treatment. Studies on the use of psychotherapy and antidepressants to treat depression in this group are comparatively rare [41] [42]. New research, nevertheless, appears to be necessary to confirm the effectiveness of depression treatment and the security of antidepressant usage when there is comorbidity [43].

Most given medications where medications were Escitalopram [41] [44]. Which is a SSRI, one of the safest class of antidepressants.

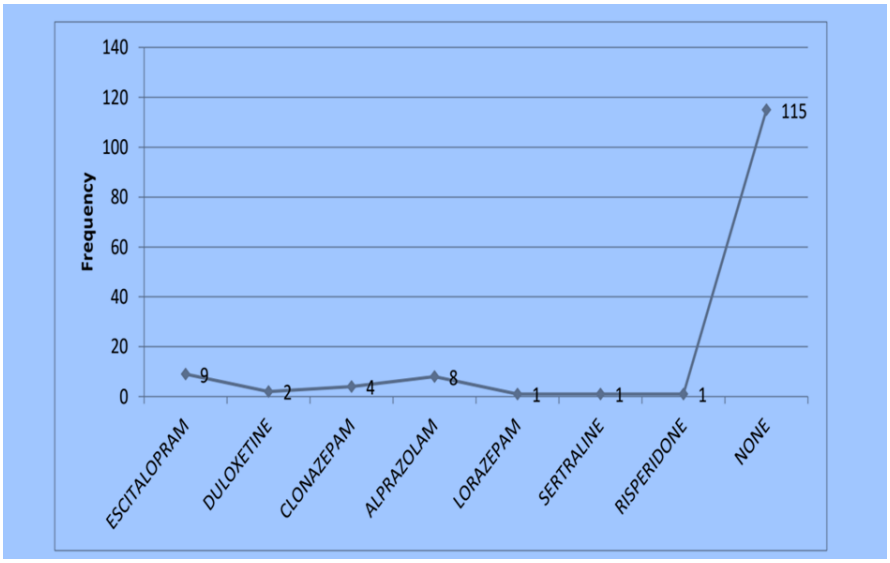

Figure 4: **Drugs given for depression among total population**

Another study noted that only one third of diabetic patients are treated with antidepressant therapy by their diabetologist [29] [45]. Other drugs prescribed include Clonazepam, Alprazolam, Lorazepam, Sertraline [41] [44], Risperidone and Duloxetine [46].

On prescription analysis drug interaction between medications were analyzed. Among hypoglycemic agent's drug interactions were revealed which leads to hypoglycemic conditions (31.21%). These could explain one of reason for recent hypoglycemic event among patients. These shows that therapy modification (31.2%) is essential.

The same analysis was conducted between hypoglycemic agents and antidepressants. Drug interactions were also found among them (17.02%) which is less compared to the previous scenario. These also points that therapy modification (9.2%) and therapy monitoring (7.8%) are required.

Out of the total population it was found that 69.5% of them had depression. However, treatment for depression were not received by every depressive patient. The results found were significant (p=0.001). Only 26.5% among depressive patient received treatment. The remaining patient didn't receive any interventions.

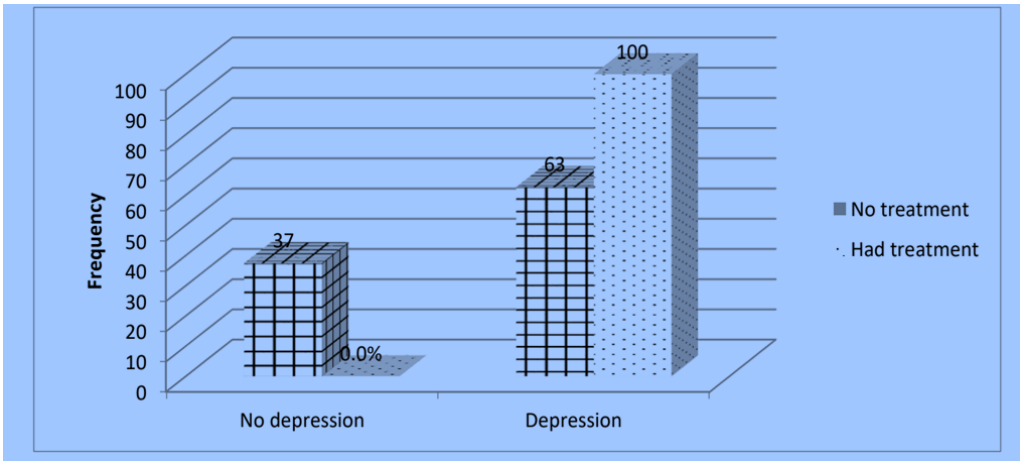

Figure 5: **Categorization based on management of depression among total population**

Prioritizing health economic analysis in trials evaluating psychological and pharmaceutical therapies for diabetes and depression ought to be the next step. To properly direct health-care spending, cost-effectiveness studies for psychological and pharmaceutical therapies must be expanded.

CONCLUSION

The study was performed to evaluate the prevalence of depression in type 2 diabetes mellitus patients. Among study participants with diabetes mellitus, depression was quite prevalent. Individuals with diabetes mellitus showed varying degrees of depression. The study reveals that the type 2 diabetes mellitus may induce the depression in the patients and majority of the respondents with long duration of type 2 diabetes mellitus are suffering from mild to moderate depression. This could be linked to psychological issues, physical ailments, and trouble following the prescribed course of treatment. The odds of depression are high among patients who have had diabetes mellitus for longer than five years, those who are married, female respondents and family diabetic history. Severe depressions are found in old age patients. Majority of the patients with diabetic depression does not seek support to manage the depression due to lack of information about their depressive condition. Thus, it is imperative that patients with diabetes mellitus undergo a comprehensive screening process to detect this comorbid illness, and they must receive collaborative therapy for both diabetes mellitus and depression. Counselling should be also implemented to enhance treatment adherence, and mechanism to handle stressful life events.

STRENGTH AND LIMITATIONS OF THE STUDY

Strength

➢ This study's strength are use of pure type 2 diabetes mellitus patients, its large sample size, high response rate, and use of techniques that had been validated.

➢ The study included inpatients along with outpatients thus a temporal association between complications and depression could be established.

Limitations

➢ This study was performed in tertiary care hospital and majority patients visited were with comorbidities therefore the study population was limited.

➢ The study was carried out for a period of 6 month thus it could include only a small sample size.

➢ Because of the same reason the study does not provide a clear cause and effect connection between socio-demographic factors and prevalence of depression.

➢ Due to self-reported demographic data and PHQ-9 questionnaire there might be misclassification of participation.

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