Prevalence and Associated Factors of Depression among Diabetes Patients in Selected Hospital at Pokhara, Kaski

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Abstract
Although in recent decades depression and diabetes patients are increasing the numbers and proportions worldwide. Eighty percent of individuals with Type 2 diabetes mellitus (T2DM) dwell in low- and middle-income countries. The real crisis of depression and diabetes, where it exists, is the personal crisis of day-by-day. The objectives of this study is to determine the prevalence and associates factors of depression among diabetic patients in selected hospital in Nepal. A cross-sectional study was conducted at tertiary center of Pokhara, Kaski. Study participants identified with type 2 diabetes mellitus (n=330). Blood pressure, anthropometrics (height, weight and hip circumference) and glycated hemoglobin (HbA1c) were collected, a semi-structured interview was utilized to obtain information on socio-demographic and Beck Depression Inventory (BDI) was used as a tool to assess depressive symptoms among patients with type 2 diabetes mellitus. Logistic regression was used to investigate the associate factors of depression with diabetes patients. Majority (68.2%) of the respondents had no depression with diabetes, 16.7% of respondents having moderate, 12.4% having mild and few (2.7%) had severe depression with diabetes. Depression was significantly associated with Marital status (p=0.014), Educational status (p=0.016), Occupational status (p=0.003) and Drinking alcohol (p=0.020). The prevalence of depression with Diabetes in this study was 31.8%.

Keywords: Depression; Prevalence; Associated Factors; Glycated hemoglobin; Beck Depression Inventory.

Introduction
Type 2 diabetes is defined as a condition when cells cannot use blood sugar efficiently to meet the body’s needs due to insufficient production of insulin by Pancreases. Depression is a mood disorder in which one feel so low that things previously enjoyed, no longer hold that same joy. Type 2 diabetes mellitus (T2DM) and depression are major public health issues. Diabetes mellitus (DM) is a common chronic medical disorder with serious medical and financial outcomes. Worldwide, more than 365 million people are estimated to have T2DM, and almost 300 million people have major depression. Both these disorders are projected to be among the five leading causes of disease burden by
Depression is common among diabetes and is associated with poor results. Both diabetes and depression are related with premature morbidity and mortality, and when these conditions exist together, the risk of developing co-morbidities, complications, patient suffering and related cost increases. Depression can be seen as a modifiable independent risk factor for the development of T2DM and for progression of complications from either type 1 or type 2 diabetes (Williams et al., 2006). The recognition and addressal of this association can have significant implications for prevention and treatment of these disorders (Shaw et al., 2010). Eighty percent of individuals with T2DM dwell in low and middle-income countries. Nowadays, depression and diabetes patients are increasing the numbers and proportions worldwide. Depression and diabetic population should not be seen as a crisis. The real crisis of depression and diabetes, where it exists, is the personal crisis of day-by-day existence (Mendenhall et al., 2014). Government of Nepal has focused on prevention of non-communicable disease like diabetes. So, this study aims to find out the prevalence and associated factors of depression among type 2 diabetic patients in selected hospitals and to determine association of depression with selected demographic variables, clinical factors and glycemic control.

Yet much of the research around depression among people with diabetes has been conducted in high-income countries. This study adds to the constrained data available on the prevalence of depression in diabetes from Nepal. It has special relevance for Nepal, having high prevalence of both these disorders (Ramachandran et al., 2014; Kroenke et al., 2001).

**Methods**

This was a hospital based descriptive, cross-sectional study. Population consisted of type-2 diabetic patients attending tertiary centers (Gandaki Medical College, Pokhara, Nepal) which is 550 bedded multi-disciplinary teaching hospital. The inclusion criteria for this study were as follows:

1. All patient with at least three months of diagnosed type II diabetes and no chronic medical illness before detection of diabetes 2. Pregnant women, patients with no psychiatric or family history of depression or mental illness. 3. Those aged 20 years and above and capable of independent communication and giving informed verbal consent.

Non probability consecutive sampling method was used to select diabetic patients from selected Hospital. Sample size was calculated based on 30 % prevalence of depression among diabetic patients in 2011. Here, \( n = \frac{z^2pq}{d^2} \)

Ethical clearance was taken from institutional ethical review committee of Gandaki medical College. After obtaining informed verbal consent from participants, data were collected by the research team. Structured, pre-tested questionnaire was administered by the interviewers to collect information on socio-demographic characteristics, disease variables and behavioral characteristics. Blood pressure, anthropometrics (height, weight, waist and hip circumference) and glycated hemoglobin (HbA1c) was measured at the time of interview.

The Beck Depression Inventory (BDI) was used as a tool to assess depressive symptoms among patients with type 2 diabetes mellitus. Pre-testing of the questionnaire was performed to gather information about understandability, time consumed by each question, consistency among related variables and acceptability. After reviewing the outcome of pre-testing, changes were incorporated accordingly.

The data were analyzed using the Statistical Package for social Science (SPSS) version 20. Data checking was done to detect any coding errors, illogical or missing values. Descriptive statistics like frequency, percentage, mean and standard deviation was used to describe the characteristics of collected data. Pearson Chi-square test was used to find out the association between two categorical variables. To assess the association between depression and different explanatory variables, logistic regression was performed. The significant level was set at \( p < 0.05 \).

**Results**

Table 1 reveals majority (66.1%) of the respondents were between age of 40-64 years, more than half 59.1% being female. Most (82.1%) were Hindu and 86.4% were married, 46.7% were illiterate, 35.2% were housewife. Almost equal (50.9%) in urban area, most (67.6%) had single family type with almost half (49.4%) having family members from 5-10 members. Most of the participants (38.2%) had monthly family income between NRs. 10000-20000 while most of the participants (41.5%) had family expenditure less than NRs. 10000. Majority (51.2%) had diabetes for 2 to 5 years, oral hypoglycemic drug was used by 79.7% of the patients while 20.3 % were on insulin. Majority (80.7%) were compliant to treatment, 17.9% had family history of diabetes, 60.3% of the participants never smoked while majority (64.5%) never drank alcohol, 67.9% of the patient had history of hypertension. Majority of the patients (47.3%) were overweight.
Table 1: Socio-demographic information of the participants (n=320)

| Variables                        | Frequency | Percent |
|----------------------------------|-----------|---------|
| **Age (years)**                  |           |         |
| 20-39                            | 17        | 5.2     |
| 40-64                            | 218       | 66.1    |
| 65+                              | 95        | 28.7    |
| **Sex**                          |           |         |
| Male                             | 135       | 40.9    |
| Female                           | 195       | 59.1    |
| **Religion**                     |           |         |
| Hindu                            | 271       | 82.1    |
| Buddhist                         | 53        | 16.1    |
| Christian                        | 4         | 1.2     |
| Muslim                           | 2         | 0.6     |
| **Marital Status**               |           |         |
| Married                          | 285       | 86.4    |
| Unmarried                        | 35        | 10.6    |
| Divorced/Separated/ Widow/widower | 10       | 3.0     |
| **Education**                    |           |         |
| Illiterate                       | 154       | 46.7    |
| Primary level                    | 71        | 21.5    |
| Secondary level                  | 55        | 16.7    |
| Higher secondary level           | 18        | 5.5     |
| Bachelors                        | 19        | 5.5     |
| Masters                          | 13        | 3.9     |
| **Occupation**                   |           |         |
| Unemployed                       | 31        | 9.4     |
| Agriculture                      | 52        | 15.8    |
| Daily wages                      | 27        | 8.2     |
| Business                         | 35        | 10.6    |
| Service                          | 64        | 19.4    |
| Housewife                        | 116       | 35.2    |
| **Residence**                    |           |         |
| Others                           | 5         | 1.5     |
| Rural                            | 162       | 49.1    |
| Urban                            | 168       | 50.9    |
| **Type of family**               |           |         |
| Single                           | 223       | 67.6    |
| Joint                            | 107       | 32.4    |
| **Number of family members**     |           |         |
| 1-4                              | 255       | 48.6    |
| 5-10                             | 259       | 49.4    |
| >10                              | 11        | 2.0     |
| **Monthly family income (NRs.)** |           |         |
| ≤10000                           | 54        | 16.4    |
| 10001-20000                      | 126       | 38.2    |
| 20001-30000                      | 92        | 27.9    |
| 30001-40000                      | 32        | 9.7     |
| 40001-50000                      | 11        | 3.3     |
| >50000                           | 15        | 4.5     |
| **Monthly family expenditure (NRs.)** |       |         |
| ≤10000                           | 137       | 41.5    |
| 10001-20000                      | 123       | 37.3    |
| 20001-30000                      | 50        | 15.2    |
| 30001-40000                      | 7         | 2.1     |
| 40001-50000                      | 4         | 1.2     |
| >50000                           | 9         | 3.0     |
| **Duration of Diabetes**         |           |         |
| <2 years                         | 68        | 20.6    |
| 2-5 years                        | 169       | 51.2    |
| 6-10 years                       | 74        | 22.4    |
| 11-15 years                      | 13        | 3.9     |
| >15 years                        | 6         | 1.8     |
| **Treatment Modalities of Diabetes** |       |         |
| Oral Hypoglycemic Drugs          | 263       | 79.7    |
| Insulin                          | 67        | 20.3    |
| **Compliance to treatment**      |           |         |
| Yes                              | 267       | 80.9    |
| No                               | 63        | 19.1    |
| **Family History of Diabetes**   |           |         |
| Yes                              | 59        | 17.9    |
| No                               | 267       | 80.9    |
Table 1: Socio-demographic information of the participants (n=320)

| Variables               | Frequency | Percent |
|-------------------------|-----------|---------|
| Smoking Habit           |           |         |
| No                      | 271       | 82.1    |
| Never                   | 209       | 63.3    |
| Previous smoker         | 119       | 36.1    |
| Yes                     | 02        | 0.6     |
| Never                   | 213       | 64.5    |
| Previous drinker        | 111       | 33.6    |
| Yes                     | 06        | 1.8     |
| Yes                     | 106       | 32.1    |
| No                      | 224       | 67.9    |
| Yes                     | 40        | 12.1    |
| No                      | 290       | 87.9    |
| Underweight             | 8         | 2.4     |
| Normal                  | 92        | 27.9    |
| Overweight              | 156       | 47.3    |
| Obese                   | 73        | 22.0    |

Fig. 1 reveals 68.8% of the respondents had no depression which is followed by 16.7% of respondents having moderate depression and 12.4% having mild depression. Few (2.7%) had severe depression. Table 2 shows statistically significant association of depression range with marital status (p=0.014), Educational status (p=0.016), occupational status (p=0.003) and drinking alcohol (p=0.020). No statistically significant association of depression range with Sex, Religion, Residence, Family type, Duration of diabetes, Treatment modality, Compliance of treatment, Family history of diabetes and HB1Ac. Table 3 shows that low education level BDI-la increase of 0.76, occupational status 0.75 BDI-la score increase smoking habit (β=0.35, df=0.02, p=0.4) as more risk factors for depression. These results indicate that diabetes with a co morbid low education level and known case of hypertension were 0.76 and 1.1 times more likely to suffer from depression. Regarding residence, urban (β=0.58, df=0.03, p=0.7), known case of HTN was (β=1.1, df=0.72, p=0.51).
Table 2: Association of Depression with Socio-Demographic Characteristics and Diabetes Status (n=320)

| Dependent variable | Independent variables | Pearson chi-square value | p-value |
|--------------------|-----------------------|--------------------------|---------|
| Depression Range   | Sex                   | 0.685                    | 0.877   |
|                    | Religion              | 9.704                    | 0.375   |
|                    | Marital status        | 20.760                   | 0.014*  |
|                    | Educational status    | 28.941                   | 0.016*  |
|                    | Occupation            | 43.144                   | 0.003*  |
|                    | Residence             | 11.576                   | 0.072   |
|                    | Family type           | 2.906                    | 0.821   |
|                    | Duration of diabetics | 55.268                   | 0.427   |
|                    | Treatment modality    | 2.991                    | 0.810   |
|                    | Compliance of treatment| 8.449                  | 0.207   |
|                    | Family history of diabetics | 4.862         | 0.182   |
|                    | Smoking               | 10.095                   | 0.122   |
|                    | Drinking Alcohol      | 15.004                   | 0.020*  |
|                    | History of blood pressure | 6.802              | 0.780   |
|                    | Drugs of HTN          | 1.400                    | 0.706   |
|                    | BMI                   | 5.732                    | 0.100   |
|                    | Diabetic level        | 1.170                    | 0.557   |

Table 3: Multivariable Regression for Depression Symptom

| Predictor total BDI Score | Predictor total BDI Score |
|---------------------------|---------------------------|
| OR (95%, CI)              | P -value                  |
| Sex                       | 0.969 (0.604, 1.555)      | 0.869                      |
| Educational status        | 0.766 (.634, .925)        | .006*                      |
| Occupation                | 0.757(0.614, 0.863)       | .00*                       |
| Residence (Urban)         | 0.588(.036, 9.578)        | .709                       |
| Residence (Rural)         | 0.350(0.021,5.712)        | .462                       |
| Smoking (Yes)             | 357(.022,5.808)           | .469                       |
| Smoking (No)              | 676 (0.41, 11.02)         | .789                       |
| Drinking Alcohol (Yes)    | 0.205(.037, 1.150)        | .072                       |
| Drinking Alcohol (No)     | 0.260(.046, 1.486)        | .130                       |
| History of HTN (yes)      | 1.180(0.721,1.931)        | .511                       |
| History of HTN (No)       | 0.976(0.3023,1.310)       | .968                       |
| Family history of HTN     | 0.715(0.3351,5.29)        | .387                       |
| Marital Status (Yes)      | 1.392(2.840,2.101)        | .224                       |
| Marital Status (No)       | 1.245(.7651.234)          | .236                       |

OR: Odd ratio, CI: Confidence interval, *p ≤ 0.05

Discussion

Out of 320 participants in the study, we found 105(31.8%) participants were depressed, this rate is comparable to the prevalence of depression (36.6%), as reported in a worldwide meta-analysis of studies among person with diabetes in clinical settings (Ali et al., 2006). The rate is higher than that observed in the United States, where the prevalence of depression among persons with diabetes range from 2%-28% (Li et al., 2008). A tertiary hospital-based study conducted in Bangladesh showed 34.8% depression in persons living with diabetes (Rahman et al., 2011). This is substantially lower than the study done at Karnataka South India where they found 142 (56.8%) were have depression (Shaban et al., 2006). The possible explanation for the difference in the results may include difference in tools used, sample size different cut-off scores employed and socio demographic status.
Depression was found to be related to illiteracy, some past studies have also reported to similar findings (Roy et al., 2012). Highly educated people are less likely to be depressed because they can attain better jobs and have greater healthcare resources than less educated people (Lahelma et al., 2004). In our sample, unemployed patients with diabetes had statistically significant association (p=0.003) with depression. This finding was similar to the study done at South India (Prasad, 2017). In this study statistically significant association of depression range with marital status (p=0.014), this finding was similar to the finding done at Uttar Pradesh, India (Sharma et al., 2019). In this study, no statistically significant association of HbA1c with depression was found, this finding was contradictory to the finding of India (Sharma et al., 2019). The present study did not reveal any association between behavioral characteristics of tobacco and alcohol. This finding was similar to the study done by Niraula et al. at urban medical Centre in Nepal (Niraula et al., 2013). Most other studies have shown an association of these behavior with depression among person living with diabetes (Goldney et al., 2004). In this study no statistically significant association of depression range was found with treatment modality, compliance of treatment, family history of diabetes, this finding was similar to the study done by Prasad at South India Prasad, 2017).

Low education level and hypertension was identified as risk factors for depression in this study which was 0.76 and 1.1 times more likely to suffer from depression. This finding is supported by that of previous studies that linked other physical illnesses such as cardiovascular disease to depression (Sharma et al., 2019). Although Depression is associated mortality rates in middle income countries are almost 1:3 fold higher than in industrialized nations (Van Dooren et al., 2013).

Conclusion

The prevalence of depression with diabetes in this study was 31.8%. Almost one in every three patients with diabetes marital status, educational status, Occupational status and drinking alcohol are statistically significant association of Depression. Education level, Occupational status and Smoking habit are more risk factors for depression. Depression with diabetes has been identified as public health priority in Nepal given the current and predicted burden of all forms of disease within the country. Further research in developing countries will be key, given the rising levels of associated factors and morbidity rates within the region.

Ethical consideration

Ethical clearance was obtained from institutional ethical review committee GMC (Gandaki Medical College), Kaski, Pokhara and written permission from the authority was obtained for data collection. Confidentially was maintained throughout the period and no participants were harmed in the study.

Conflict of Interest

There is no conflict of interest with the present study.

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