



---

## **Depression, Anxiety and Stress among Non-communicable Disease Patients: Diabetes Mellitus and Hypertension as Paradigmatic Illnesses**

Subah A. Yesuf\*

*MD, M.A in Counseling Psychology, FM Resident, Addis Ababa University, POB: 1167*

*Email: lazimsubah@gmail.com*

### **Abstract**

This study was projected to find out the prevalence of depression, anxiety and stress in patients with non-communicable diseases having follow-up in Black Lion Specialized Hospital and investigate certain predictor variables behind the negative mental states. This cross-sectional study comprised of a sample of 382 patients with confirmed non-communicable diseases selected via convenience sampling technique. The data was collected using interview based structured questionnaires, after taking informed consent, from 16th January to 2nd April, 2019. Levels of depression, anxiety and stress were gauged using the short version of the Depression Anxiety Stress Scales (DASS)-21. The study findings revealed that significant proportion of the studied respondents had mild to severe levels of depression, anxiety and stress scores, with a prevalence of 38.2 %, 51.6 %, & 27.7 %, respectively. There was no statistically significant difference between the two types of non-communicable diseases studied. The strongest predictors for high depression, anxiety & stress scores among diabetic and hypertensive patients were marital status and clinical stage of the disease, each with p value <0.001. Similarly, sex, average monthly income, and duration of the disease showed significant predictive role. On the basis of this result, the researcher came to know that great numbers of patients of non-communicable diseases on medical follow up were suffering from different levels of anxiety, depression and stress. Thus, this study implied that psychological aid should be synchronized with and be a litmus test to the overall clinical care of non-communicable disease patients.

**Keywords:** NCDs; Diabetes mellitus; Hypertension; Psychological Distress; Depression; Anxiety and Stress.

---

\* Corresponding author.

## **1. Introduction**

Needless to mention, no human being is immune to the myriads of life challenges. Any hypothetical person passes through, inter alia, a number of illnesses in his/her life time that begins at the womb and ends at the tomb. Among the various disease entities that affect humans are a group of chronic diseases called non-communicable diseases. These diseases do not only affect the human body; they can also affect the psychological profile of humans. Non-communicable diseases (NCDs) are among the leading health and development challenges of the 21st century, in terms of both the human suffering they cause and the harm they inflict on the socioeconomic fabric of countries, particularly low- and middle-income countries. Due to the increasing prevalence of NCDs, the death rate is increasing globally and killing more people each and every year. Contrary to the general belief, the available data demonstrate that nearly 85% of deaths were due to NCDs occurring in low and middle income countries [1]. A growing body of literature has reported that patients with diabetes mellitus and hypertension are more likely to suffer from depression, anxiety and stress than the general population as was noted by authors in [2, 3]. Despite the overwhelming evidence of alarming prevalence of the NCDs both in the international milieu and the national context on top of underreporting [4], and their potential psychosocial consequences on patients as implied by numerous studies including [3], there was no published or on-going research that explicitly documents the magnitude & pattern of depression, anxiety and stress among NCD patients along with associated risk factors in Ethiopian context by the time of conception of this study, as far as the researcher is concerned. Therefore, the primary aim of the present study was to investigate the magnitude of the negative mental states — anxiety, depression and stress symptoms — among diabetic and hypertensive patients using the short-form of the Depression Anxiety Stress Scale (DASS-21) and to gauge any significant association of each of these mental states with some potential contributing variables.

## **2. Materials and methods**

This cross-sectional, basic research comprised of diabetic and hypertensive patients who presented themselves for medical treatment at Black Lion Specialized Hospital of Addis Ababa during the study period from 16th of January up to 2nd of April, 2019. The hospital is a very huge referral governmental hospital and an active research area with a magnificent patient flow, including largest varieties of patients with NCDs. The minimum number of subjects needed for the study was calculated using the Kish's formula:  $\text{Sample size} = z^2 (p (1-p)/c^2)$ , where  $z = 1.96$  for 95% confidence interval (CI);  $p =$  prevalence of depression (46 %) for hypertension based on [5] study, and  $c =$  desired level of precision (in this case, precision of 5%). In a two and half months-time frame, data was collected from a total of 382 (diabetics = 287 and hypertensives = 95) sampled participants who were present at the hospital during the data collection period and who gave their consent to participate in the study and who met the inclusion criteria; the inclusion criteria being: diagnosed as diabetic or hypertensive at a medical facility by a health professional and attending outpatient treatment at the hospital, being free from other self-reported psychiatric or physical comorbidity, and being able to comprehend Amharic language. The study was carried out through providing clients a self-administered structured questionnaire consisting of three sections, (i) socio-demographic details (ii) clinical and lifestyle conditions regarding the NCD and (iii) detection of depression, anxiety and stress. Convenience sampling technique was employed, taking into account the notion that diabetic and hypertensive patients oftentimes come to the hospital with empty stomach for

investigation reasons such as fasting blood sugar and lipid profile. Certain data variables (such as age, duration of disease, administered medications, & comorbidities) were verified from patients’ medical charts. The 21-item DASS is a well-known self-report measure that is easy to administer, precise, quick to score, and freely available [6]. It measures the negative emotional states of depression, anxiety and stress using a 4-point severity/frequency scale to rate the extent to which subjects had experienced each negative state over the past week [6]. Before the main data was collected, pilot study was conducted using 30 patients to check the reliability and content validity of the instrument, which resulted in Cronbach’s coefficient alpha of 0.84, 0.73 and 0.72 for the depression, anxiety and stress subscales, respectively and an overall Cronbach’s coefficient alpha of the scale 0.89.

**Table 1:** DASS-21 severity ratings.

Severity	Depression	Anxiety	Stress
Normal	0-4	0-3	0-7
Mild	5-6	4-5	8-9
Moderate	7-10	6-7	10-12
Severe	11-13	8-9	13-16
Extremely Severe	13+	9+	16+

Source: Lovibond and Lovibond, 1995

Data was analyzed using International Business Machine (IBM) Statistical Package for Social Science (SPSS) version 20.02 and Microsoft Excel 2010. Group difference in the psychological variables among hypertensive and diabetic patients was assessed by making use of independent sample t-test. To examine the potential risk factors (independent variables) as predictors of the prevalence of the negative psychological constructs (dependent variables), stepwise multiple logistic regression with forward selection method was employed. The variables which had p-value < 0.2 were included in multiple logistic regression analysis. Two tails with alpha ( $\alpha$ ) values of 0.05 were used in all tests. P value less than 0.05 was considered as statistically significant. The study was undertaken by giving a brief introduction on the purpose of the research and the procedures involved prior to distribution of questionnaire. Participants were then informed about their rights not to participate in the study at any point of the data collection and written consent was taken. Confidentiality of participants’ information provided was preserved. This study was conducted under the permission of the Ethical Review Committee of School of Psychology of Addis Ababa University.

### 3. Results

#### 3.1. Socio-demographic characteristics of participants

A tabular presentation of these demographic and socioeconomic characteristics of study participants is depicted in Table 2. In terms of age, majority (31.4%) of participants were older 50 years of age, followed by 41-50 year-age group (26.4%), 31-40 year-age group (21.7%) and  $\leq 30$  year-old (20.4%) in that order. The median and mode age of participants were 44.0 & 48.0, respectively. The sex composition reveals 42.4% and 57.3% for

male and female, respectively. Analysis of marital status depicts majority (52.4%) of the patients (n=200) were married, 21.7% were single, while 13.9% and 12% of them were widowed and divorced correspondingly. Looking at their educational background, the bulk of participants (38.5%) were those who completed primary school, followed by college graduates (35.6%) and high school graduates (24.6%), and the remaining 1.3% reported to have educational level limited to being able to read and write. Based on the participants' response, 37.4% of respondents were Orthodox Christians, 35.3% Muslims, 22.8% Protestants, and the rest 4.5% were followers of other religions. Regarding occupation, 30.9% of patients were merchants, 22.3% were peasants, 11.8% were unemployed, 13.4% were manual workers, and 11.8% were governmental workers whereas housewives and retired patients constituted 5.2% each. According to the data provided, most patients 43.7% earned less than 2000 ETB per month, 33.5% earned between 2000 and 5000, 20.4% earned within the range of 5001 to 10,000 and only 2.4% of the participants had greater than 10,000 ETB monthly earnings. Nearly two-third of patients (n=260, 68%) were obese with BMI of not less than 25 and the remaining 31.9% had BMI less than 25.

**Table 2:** Socio-demographic profiles of NCD patients (N=382)

	Characteristic	Number	Percentage
Age group	Age group	78	20.4
	≤30 years	83	21.7
	31-40 years	101	26.4
	41-50 years	120	31.4
Sex	Male	162	42.4
	Female	220	57.6
Marital Status	Single	83	21.7
	Married	200	52.4
	Divorced	46	12.0
	Widowed	53	13.9
Educational Status	Can read and write	5	1.3
	Completed primary school	147	38.5
	Completed secondary school	94	24.6
	College graduate	136	35.6
Religion	Orthodox	143	37.4
	Muslim	135	35.3
	Protestant	87	22.8
	Others	17	4.5
Occupation	House wife	20	5.2
	Merchant	118	30.9
	Peasant	85	22.3
	Manual worker	51	13.4
	Governmental worker	45	11.8
	Unemployed	45	11.8
	Retired	18	4.7
Income	<2000 birr	167	43.7
	2001-5000	128	33.5
	5001-10000	78	20.4
	>10000	9	2.4
Body Mass Index	<25	122	31.9
	25-30	235	61.5
	>30	25	6.5

If we navigate table 3, we can easily see that the frequency of NCDs in among participants of the study. Accordingly, most of them (75.1%) were diabetic and the remaining (24.9%) were hypertensive patients. The duration-wise categorization of the study participants shows that most of them (39.5%) claimed to live with their disease for more than 10 years, followed by those of 2.1 to 5 years duration (28.8%), those of 5.1-10 years duration were 18.6%, whereas only 50 of the participants were in their first two years of diagnosis during the study. The mean duration of the NCDs in the participants was 8.1 years. About half of the participants (49.5%) admitted to possess comorbid medical conditions on top of their primary medical concern whereas the other half had no known comorbidity by the time of their clinic visit. When we look at the number of medications patients regularly take, almost two-thirds (67%) of them take either one or two medications, and those who take 3, 4, and 5 comprise 17.5, 13.9 and 1.6%, respectively. Most (94.5%) of the participants were nonsmokers while only 5.5% of them reported to be smokers. With regard to family history, nearly half (48.7%) of the participants had positive family history of the NCD they are diagnosed to have in contrast to the remainders. Taking awareness of their disease into account, majority (86.6%) of the participants reported to be fully aware of their clinical disease while only 13.6% were not.

Having a glance at the reported clinical stage of the disease, more than half (54.2 %) of all participants were in good conditions, followed by bad (28.8%), very good (9.4%) and very bad (7.6 %) clinical conditions, respectively. And finally, 61.3 % of the patients claim to perform regular physical exercise while the remaining 38.7 % report not to do so.

### ***3.2. Prevalence of Depression, Anxiety and Stress in Hypertensive and Diabetic patients***

Table 4 reveals the depression, anxiety and stress scores among non-communicable disease patients. While these scores are not diagnostic, they indicate the possible presence of depression, anxiety and stress in the subjects. In this study, scores from each dimension (subscale) were summed up separately, and depression, anxiety and stress are divided into 5 categories, which are normal, mild, moderate, severe and extremely severe according to the DASS manual.

Out of 382 of NCD patients who participated in this study, the overall prevalence of depression was found to be 38.2 % according to Depression, Stress and Anxiety Scale-21 (DASS-21) cut scores. Among those patients with depression, 19.4% and 9.7% had moderate and mild depressive symptoms, respectively. The remaining 6% and 3.7% had severe and extremely severe depressive symptoms correspondingly. And more than half (61.8%) of the NCD patients were having normal depression subscale scores of DASS-21. The mean and standard deviation for depression score were computed to be 4.5 and 4, respectively.

**Table 3:** Lifestyle and clinical details of study participants.

Characteristic	Number	Percentage
<b>Disease type</b>		
Diabetes Mellitus	287	75.1
Hypertension	95	24.9
<b>Duration</b>		
<2 years	50	13.1
2.1-5 years	110	28.8
5.1-10 years	71	18.6
>10 years	151	39.5
<b>Comorbidity</b>		
Yes	189	49.5
No	193	50.5
<b>Smoking</b>		
Yes	21	5.5
No	361	94.5
<b>Family history</b>		
Yes	186	48.7
No	196	51.3
<b>Awareness</b>		
Yes	331	86.6
No	51	13.4
<b>Stage</b>		
Very bad	29	7.6
Bad	110	28.8
Good	207	54.2
Very good	36	9.4
<b>Physical exercise</b>		
Yes	234	61.3
No	148	38.7

**Table 4:** Prevalence of depression, anxiety and stress by disease type.

	Diabetic patients N=287 n (%)	Hypertensive patients N=95 n (%)	Total N (%)	X <sup>2</sup>
<b>Depression<sup>a</sup></b>				6.98
No	186 (64.8)	48 (50.5)	234 (61.3)	
Mild	26 (9.0)	11 (11.6)	37 (9.7)	
Moderate	51 (17.7)	23 (24.2)	74 (19.4)	
Severe	14 (4.9)	9 (9.5)	23 (6)	
Extremely severe	10 (3.5)	4 (4.2)	14 (3.7)	
<b>Anxiety<sup>b</sup></b>				12.95*
No	141 (49.1)	44 (46.3)	185 (48.4)	
Mild	56 (19.5)	10 (10.5)	66 (17.3)	
Moderate	43 (15)	19 (20)	62 (16.2)	
Severe	22 (7.6)	17 (17.9)	39 (10.2)	
Extremely severe	25 (8.7)	5 (5.2)	30 (7.9)	
<b>Stress<sup>c</sup></b>				8.53*
No	209 (72.8)	64 (67.4)	273 (71.5)	
Mild	14 (4.9)	13 (13.6)	27 (7.1)	
Moderate	51 (17.8)	14 (14.7)	65 (17)	
Severe	13 (4.5)	4 (4.2)	17 (4.5)	
Extremely severe	0	0	0	

Note.  $X^2$ = Pearson chi square; Degrees of freedom for depression & anxiety is 4 whereas for stress is 3. \*p value <0.05.

<sup>a</sup>Depression was scored as per: normal (0-4), mild (5-6), moderate (7-10), severe (11-13) and extremely severe (>13). <sup>b</sup>Anxiety was scored as per: normal (0-3), mild (4-5), moderate (6-7), severe (8-9) and extremely severe (>9). <sup>c</sup>Stress was scored as per: normal (0-7), mild (8-9), moderate (10-12), severe (13-16) and extremely severe (>16).

For the anxiety status, 48.4 % of the respondents were free from it while the rest had DASS-21 anxiety subscale scores of 5 and above. Among those with anxiety, 17.3 % and 16.2% had mild and moderate anxiety symptoms, respectively. The remaining 10.2 % and 9.7 % had severe and extremely severe depressive symptoms correspondingly. The mean and standard deviation for anxiety score were 4.1 and 3.3, respectively. Moreover, 72.3% of the respondents do not have any relevant stress scores as per the DASS-21 scoring standards. Those who were with mild level of stress consist of 7.1%, followed by moderate level of stress (17%) and severe level of stress (4.4%). However, no extremely severe level of stress (0%) was noted. The mean and standard deviation obtained for stress score were 5.1 and 4.3, respectively.

**3.3. Differences in depression, anxiety and stress among NCD patients**

Table 5 displays independent sample *t*-test analysis that was run to examine any difference of depression, anxiety and stress scores between diabetic and hypertensive patients. The difference between the mean scores of depression, anxiety and stress was merely due to chance.

**Table 5:** Independent sample t-test on depression, anxiety and stress scores (DV) with independent variable (IV) of disease type, N=382.

	Levene's Test for Equality of variances		Mean Score		<i>t</i> test for Equality of Means			
	F	P value	DM	HTN	T	P value	MD (95 CI)	SED
Depression Score	6.9	0.09	4.4	4.8	-1	0.321	-.46(-1.4-.46)	.47
Anxiety Score	6.6	0.11	4.1	4.2	-0.11	0.914	-.043 (-.82-.74)	.4
Stress Score	9.4	0.33	5.2	4.7	0.93	0.354	.47 (-.53-1.47)	.51

Note. Equal variances assumed. Degree of freedom =380; SED= standard error difference; CI= confidence interval; MD= mean difference;; DM= diabetes mellitus; HTN= hypertension

**3.3. Depression, anxiety and stress and correlates**

Depression, anxiety and stress scores were categorized into a dichotomous response (yes/no) before submitted to univariate analysis. Participants with a cut-off score of >4 in depression, >3 in anxiety and >7 in stress dimension were considered as having these disorders as referenced by the DASS-21. The independent variables which had *p* value < 0.2 in bivariate analysis were included in multiple logistic regression analysis. Then, a forward selection (conditional) method was used to identify variables that could be plausibly associated with

depression, anxiety and stress in the separate models. According to the bivariate analysis reports generated using binary logistic regression (Table 6a & Table 6b), there are significant association between sex, marital status, monthly income, duration of illness, number of medications taken, family history of the chronic disease, awareness, stage of the disease and physical exercise and depression, with monthly income and stage of the disease being the most significant ones. Female patients (Unadjusted OR 1.56; 95% CI 1-2.4), divorced patients (Unadjusted OR 2.3; 95% CI 1.1-4.9), those who earned less than a total of 2000 ETB a month (Unadjusted OR 3.5; 95% CI 0.7-17.5) and those with very bad stage of the disease (Unadjusted OR 44.6; 8.6-230.5) are significantly more likely to have depression. On the contrary, there are some independent variables which didn't reveal any significant association with depression. These variables include age group, educational status, religious affiliation, type of occupation patients primarily engaged in, obesity, current smoking status, and presence of comorbid medical conditions. Regarding anxiety, there are significant association between a number of socio-demographic and clinical factors and anxiety. The factors that appeared to influence anxiety were marital status, average monthly income, duration and stage of the disease, number of medications taken, presence of comorbidity, family history of the NCD, regular physical exercise and adequate awareness about their disease. Divorced patients (Unadjusted OR 5.9; 95% CI 2.5-14.2), those who completed secondary school (Unadjusted OR 2.1; 95% CI (1.2-3.6), those who had a duration of the disease between 5 and 10 years (Unadjusted OR 1.8; 95% CI 1.0-3.2), those who earned < ETB 5000 per month (Unadjusted OR 5.6; 95% CI 0.7-46.7), those who took five medications for their medical problem (Unadjusted OR 6.25; 95% CI 0.7-55), those who had other comorbid medical conditions (Unadjusted OR 1.7; 95% CI 1.1-2.5), those claimed not to get proper awareness about their medical condition (Unadjusted OR 1.9; 95% CI 1-3), those who had positive family history (Unadjusted OR 1.7; 95% CI 1-2.5), those who don't do regular physical exercise (Unadjusted OR 3.1; 95% CI 2-4.8) and those with very bad stage of the disease (Unadjusted OR 15.2; 95% CI 4.2-55.3) are significantly more likely to have anxiety. However, no significant association was noted between age group, religious affiliation, type of occupation patients primarily engaged in, obesity, and current smoking status of participants and the anxiety symptoms. And unlike depression, anxiety showed no significant association with either of the sex groups. Regarding stress, similar to the other negative emotional states, there are significant associations with a number of socio-demographic and health-related factors. The factors that appeared to influence anxiety were age group, marital status, type of occupation patients are engaged in, average monthly income, stage of the disease, number of medications taken, presence of comorbidity, smoking status, family history of the NCD, regular physical exercise and adequate awareness about their disease. Patients who are aged 19 to 30 years of age (Unadjusted OR 3.6; 95% CI 1.9-7), divorced patients (Unadjusted OR 2.4; 95% CI 1.1-5), manual workers (Unadjusted OR 1.3; 95% CI 0.4-3.8), those who earned < ETB 2000 per month (Unadjusted OR 4.4; 95% CI 0.5-35.8), those who had other comorbid conditions (Unadjusted OR 1.8 ; 95% CI 1.1-2.8) those who took four medications as part of their medical treatment (Unadjusted OR 3.7; 95% CI 1.9-7.3), those who had other comorbid medical conditions (Unadjusted OR 1.7; 95% CI 1.1-2.5), those claimed not to get proper awareness about their medical condition (Unadjusted OR 1.2; 95% CI 0.6-2.3), those who don't do regular physical exercise (Unadjusted OR 2.7; 95% CI 1.7-4.3) and those with very bad stage of the disease (Unadjusted OR 110; 95% CI 12.7-955.8) are significantly more likely to have stress.



**Table 6a:** Bivariate analysis using binary regression of potential risk factors (socio-demographic ones) and depression, anxiety and stress.

Variables	Depression (n = 382)	Anxiety (n = 382)	Stress (n = 382)
	Unadjusted OR (95% CI)	Unadjusted OR (95% CI)	Unadjusted OR (95% CI)
Age group			**
19-30	1 (0.6-1.8)	1.5 (0.8-2.6)	3.6 (1.9-7)
31-40	2.3 (1.1-4.9)	1.8 (1-3.2)	2.2 (1.1-4.2)
41-50	1.8 (.866-3.552)	1.4 (0.8-2.4)	1.8 (1-3.4)
51-74	1 (Reference)	1 (Reference)	1 (Reference)
Sex	**	*	*
Male	1 (Reference)	1 (Reference)	1 (Reference)
Female	1.563 (1-2.4)	1.4 (.9-2.1)	0.7 (0.4-1.1)
Education		*	*
Can read & write	2.349 (.380-14.528)	1.8 (0.3-11.4)	2.4 (0.4-14.8)
1° school	0.9 (.562-1.5)	1.2 (0.8-2)	1.6 (0.9-2.7)
2° school	1.1 (.6-1.8)	2.1 (1.2-3.6)	1.8 (1-3.3)
College	1 (Reference)	1 (Reference)	1 (Reference)
Religion		*	
Orthodox	1 (Reference)	1 (Reference)	1 (Reference)
Muslim	2.4 (0.7-7.6)	1.8 (1.1-2.8)	0.8 (0.3-2.4)
Protestant	2.3 (0.7-7.4)	1.2 (0.7-2.1)	1 (0.3-3.0)
Others	1.5 (0.5-5.2)	1.1 (0.4-2.9)	1.2 (0.4-3.7)
Marital status	**	***	***
Single	1 (Reference)	1 (Reference)	1 (Reference)
Married	1.1 (0.6-1.8)	1.4 (0.8-2.2)	0.4 (0.2-0.7)
Divorced	2.3 (1.1-4.9)	5.9 (2.5-14.2)	2.4 (1.1-5)
Widowed	1.8 (0.9-3.6)	0.6 (0.3-1.3)	0.6 (0.2-1.2)
Occupation			**
Housewife	1 (Reference)	1 (Reference)	1 (Reference)
Merchant	1.2 (0.4-3.3)	0.9 (0.4-2.5)	0.8 (0.3-2.2)
Peasant	1 (0.3-2.7)	0.8 (0.3-2)	0.3 (0.1-0.9)
Manual worker	1 (0.3-2.994)	0.7 (0.2-2)	1.3 (0.4-3.8)
Gov't employee	1.1 (0.4-3.4)	0.5 (0.2-1.4)	0.4 (0.1-1.3)
Unemployed	1.9 (0.6-5.8)	0.5 (0.2-1.5)	1.5 (0.5-4.4)
Retired	1.2 (0.3-4.4)	0.3 (0.1-1.2)	0.7 (0.2-2.8)
Monthly Income	***	**	*
<2000 ETB	3.5 (0.7-17.5)	8.5 (1.0-69.4)	4.4 (0.5-35.8)
2001-5000 ETB	1.7 (0.3-8.6)	12.5 (1.5-102.8)	2.4 (0.3-20.4)
5001-10k ETB	1.2 (0.2-6.3)	5.6 (0.7-46.7)	2.6 (0.3-22)
>10,000 ETB	1 (Reference)	1 (Reference)	1 (Reference)
BMI			
<25	1 (Reference)	1 (Reference)	1 (Reference)
25-30	1.4 (0.9-2.2)	1 (0.6-1.5)	0.6 (0.4-1.0)
>30	1.5 (0.6-3.7)	0.7 (0.3-1.)	0.7 (0.3-1.9)

\*P value < 0.2; \*\*P value < 0.05; \*\*\*P value < 0.001.

Strikingly, unlike the other two negative psychological constructs, those who had no family history of the disease (Unadjusted OR 0.7; 95% CI 0.4-1) had apparently reduced odds of having stress symptoms while

**Table 6b:** Bivariate analysis using binary regression of potential risk factors (lifestyle & clinical ones) and depression, anxiety and stress.

Variables	Depression (n = 382) Unadjusted OR (95% CI)	Anxiety (n = 382) Unadjusted OR (95% CI)	Stress (n = 382) Unadjusted OR (95% CI)
Duration	*	**	
0.1-2 years	0.9 (0.5-1.8)	0.8 (0.4-1.5)	0.6 (0.3-1.3)
2.1-5 years	1.4 (0.8-2.2)	1.7 (1.0-2.8)	1.1 (0.6-1.8)
5.1-10 years	1.1 (0.6-2)	1.8 (1.0-3.2)	0.6 (0.3-1.2)
>10 years	1 (Reference)	1 (Reference)	1 (Reference)
Comorbidity	*	**	**
Yes	1.410 (.9-2.13)	1.7 (1.1-2.5)	1.8 (1.1-2.8)
No	1 (Reference)	1 (Reference)	1 (Reference)
Medications	**	**	***
1	1 (Reference)	1 (Reference)	1 (Reference)
2	1.3 (0.8-2.2)	1.2 (0.7-2)	0.6 (0.3-1.2)
3	3 (1.6-5.5)	1.3 (0.7-2.3)	1.8 (1-3.5)
4	2.1 (1.1-4.2)	3.2 (1.6-6.3)	3.7 (1.9-7.3)
5	2.4 (0.5-12.5)	6.25 (0.7-55)	1.5 (0.3-8.8)
Smoking	*	*	**
Yes	1.8 (0.7-4.4)	2 (.8-4.9)	3 (1.2-7.2)
No	1 (Reference)	1 (Reference)	1 (Reference)
Family history	**	**	*
Yes	1 (Reference)	1 (Reference)	1 (Reference)
No	1.7(1.1-2.6)	1.7 (1-2.5)	0.7 (0.4-1)
Awareness	**	**	
Yes	1 (Reference)	1 (Reference)	1 (Reference)
No	1.8 (1-3.2)	1.9 (1-3)	1.2 (0.6-2.3)
Stage	***	***	***
Very bad	44.6 (8.6-230.5)	15.2 (4.2-55.3)	110 (12.7-955.8)
Bad	43.3 (9.8-191.3)	24.6 (8-75.9)	29.2 (3.9-220.5)
Good	4.8 (1.1-21)	6.3 (2.1-18.4)	7.4 (1-55.5)
Very good	1 (Reference)	1 (Reference)	1 (Reference)
Exercise	**	***	***
Yes	1 (Reference)	1 (Reference)	1 (Reference)
No	1.6 (1.1-2.5)	3.1 (2-4.8)	2.7 (1.7-4.3)

\*P value < 0.2; \*\*P value < 0.05; \*\*\*P value < 0.001.

smoking patients (Unadjusted OR 3; 95% CI 1.2-7.2) had increased likelihood of manifesting stress symptoms as gauged by the DASS-21. On the other hand, there are no significant associations observed between sex, religious affiliation, educational status, type of occupation patients primarily engaged in, obesity, and current smoking status of participants and the stress symptoms. In contrast to depression and anxiety, stress was observed not to be associated with the time interval since the diagnosis of illness.

Table 7 shows the multiple stepwise logistic regression analysis of the potential risk factors, considered against depression, anxiety and stress as dependent variables with adjustment for religion and other relevant confounders. As each Hosmer and Lemeshow statistic reveals a significance value >0.05 value for depression, anxiety & stress individually, the model adequately fits the data.

**Table 7:** Results of stepwise logistic regression analysis as predictors of depression, anxiety and stress symptoms among NCD patients

Variables	Depression (n = 382) Adjusted OR (95% CI)	Anxiety (n = 382) Adjusted OR (95% CI)	Stress (n = 382) Adjusted OR (95% CI)
Constant	-7.689	-4.492	-5.437
Sex	**	-	-
Male	1 (Reference)	-	-
Female	2.6 (1.4-4.8)	-	-
Marital status	***	***	***
Single	1 (Reference)	1 (Reference)	1 (Reference)
Married	2 (0.8-4.8)	1.5 (0.8-2.8)	0.9 (0.4-2)
Divorced	5.5 (1.8-17.1)**	5.3 (1.9-14.8)**	5.9 (2.2-15.8)***
Widowed	9.9 (3-32.8)***	0.4 (0.19-1.1)	2.3 (0.8-6.9)
Monthly Income	*	**	-
<2000 ETB	3.4 (0.4-29)	5.6 (0.5-64.7)	-
2001-5000 ETB	1 (0.13-8.2)	16.9 (1.4-195.9)*	-
5001-10,000 ETB	1.4 (0.16-11.4)	6.8 (0.6-81.6)	-
>10,000 ETB	1 (Reference)	1 (Reference)	-
Duration	***	-	-
0.1-2 years	2.8 (0.92-8.3)	-	-
2.1-5 years	11.4 (4.4-29.3)***	-	-
5.1-10 years	0.74 (0.3-1.9)	-	-
>10 years	1 (Reference)	-	-
Medications	*	-	-
1	1 (Reference)	-	-
2	1.3 (0.6-2.7)	-	-
3	3.5 (1.3-9.3)*	-	-
4	0.7 (0.2-1.8)	-	-
5	11.6 (0.78-171.5)	-	-
Family history	**	-	-
Yes	1 (Reference)	-	-
No	2.9 (1.5-5.5)	-	-
Age group	-	-	**
19-30	-	-	5.7 (2.2-14.2)***
31-40	-	-	2.6 (1.1-5.9)*
41-50	-	-	2.9 (1.4-6.3)**
51-74	-	-	1 (Reference)
Clinical stage	***	-	***
Very bad	309.9 (36.7-2617)***	7.9 (1.9-32.9)***	209.8 (21.4-2053.2)***
Bad	225.6 (32.5-1565.4)***	19.7 (5.8-67.2)***	65.6 (7.8-553.8)***
Good	10.9 (1.8-64.6)**	3.4 (1.1-11.0)*	13.6 (1.7-112.2)*
Very good	1 (Reference)	1 (Reference)	1 (Reference)
Exercise	-	***	-
Yes	-	1 (Reference)	-
No	-	3.6 (2-6.3)	-

\*P value < 0.05; \*\* < 0.01; \*\*\* < 0.001

Regarding depression, divorced and widowed patients (Adjusted OR 5.5; 95% CI 1.8-7.1 & Adjusted OR 9.9; 95% CI 3-32.8 respectively), the patients who earned < ETB 2000 (Adjusted OR 3.4; 95% CI 0.4-29), had the illness for 2.1 to 5 years (Adjusted OR 11.4; 95% CI 4.4-29.3), had no family history of similar illness (Adjusted OR 2.9; 95% CI 1.5-5.5), and had very bad to bad disease stage (Adjusted OR 309.9; 95% CI 36.7-2617 to Adjusted OR 225.6; 95% CI 32.5-1565.4, respectively) are significantly more likely to have depression. Similarly, female patients have comparatively higher likelihood of being depressed (Adjusted OR 2.6; 95% CI

1.4-4.8) when compared to their male counterparts. However, caution is needed to interpret those variables with wide confidence interval such as clinical stage of the disease and number of medications taken. On the other hand, with a p value of 0.24 and 0.425 separately, both patients' awareness about their medical disease and their physical activity status were not found to be associated with development of depression symptomatology in patients with chronic disease like diabetes and hypertension, based on multiple regression result. The association noted in binary regression of both poor patients' awareness about their medical diseases and their physical inactivity status with depression can thus be credited to chance. Concerning anxiety, only marital status, monthly income, stage of the disease and physical exercise are noted to be strongly associated with expression of the symptoms. Thus, divorced patients (Adjusted OR 5.3; 95% CI 1.9-14.8), those who earn ETB 2001-5000 (Adjusted OR 16.9; 95% CI 1.4-195.9), patients whose clinical stage of the disease is bad to very bad (Adjusted OR 19.7; 95% CI 5.8-67.2 & Adjusted OR 7.9; 95% CI 1.9-32.9) and those who don't do regular physical exercise (Adjusted OR 3.6; 95% CI 2-6.3) are significantly more likely to have anxiety symptoms. Conversely, patients' educational status, duration of illness, number of medications taken, family history of the chronic disease, and their level of awareness about the disease were seen nothing to do with expression of anxiety symptoms both in hypertensive and diabetic patients as their p value ranged from 0.24 to 0.52. Thus, the association of patients' educational status, duration of illness, number of medications taken, family history of the chronic disease, and their level of awareness with anxiety scores observed in binary regression table were just artifact. Regarding stress, marital status and clinical stage of the disease emerged to be strongly associated with stress symptomatology. Divorced patients (Adjusted OR 5.9; 95% CI 2.2-15.8), and those with bad to very bad clinical staging (Adjusted OR 65.6; 95% CI 7.8-553.8 & Adjusted OR 209.9; 95% CI 21.4-2053.2) have significantly high probability of developing stress. Additionally, regarding stress, unlike the other dimensions of the negative psychological distress, patients younger than 31 years had higher (Adjusted OR 5.7; 95% CI 2.2-14.2) odds of having stress compared to those older than 50 years of age. In a similar comparison, those aging 31-40 and 41-50 years had a significant likelihood of having stress with a figure of (Adjusted OR 2.6; 95% CI 1.1-5.9) and (Adjusted OR 2.9; 95% CI 1.4-6.3), respectively. However, as it can be seen from table 7 (table of multiple logistic regressions), there is no significant association between monthly income, number of medications taken, history of comorbidity, smoking status, and physical exercise as independent variables and stress as a dependent variable. Hence, the crude association, the apparent relationship illustrated by binary regression between low average monthly income, between multiplicity of medications taken, presence of comorbidity and physical inactivity and elevated stress scores turned out to be insignificant with p value of >0.05 each.

#### **4. Discussion**

##### ***4.1. Prevalence of depression, anxiety and stress among NCD patients***

The main objective of the current study was to examine the magnitude of the negative mental states among diabetic and hypertensive patients and to pinpoint the significant predictor variables. In this study, the prevalence of depression in diabetic patients was 35.2%, 50.9% and 37.2 % respectively. This finding is consistent with previous studies that were conducted in different settings. Authors of [7], for instance, estimated the prevalence of depression, anxiety and depression in Pakistani diabetic individuals as 42.4%, 48.4% and 45.4%, respectively. A similar recent study conducted in Iran [8] reported the prevalence rate of 83.1%, 96%

and 78.1% for depression, anxiety and stress, respectively. Moreover, authors of [9] projected the prevalence of depression and anxiety in diabetic patients to be 85% and 95%, respectively. In another glance, the mean and standard deviation for depression, anxiety and stress in the current study were computed to be  $4.5 \pm 4$ ,  $4.1 \pm 3.3$ , and  $5.1 \pm 4.3$ , respectively. Equivalent to this finding, in 2016, authors in [8] in the study done to determine the prevalence of depression, stress and anxiety in patients with type 2 diabetes mellitus as well as their association with demographic factors in Iranian population found mean and standard deviation of  $9.45 \pm 4.8$ ,  $8.65 \pm 4.3$ , and  $10.85 \pm 4.2$  for depression, anxiety & stress, respectively. In the other fork, lower prevalence rates of the psychological problems have been estimated in other countries such as Germany to be 10.4% [10]. Oftentimes, primary care clinicians notice that diabetic and hypertensive patients have a lot of limitations including an imposed diet, frequent infections, frequent hospitalization due to complications of the disease, daily multiple medications, sexual problems, costs, as well as restrictions on childbirth in females, marriage, and employment. These can potentially lead to a high prevalence of negative psychological problems like stress, depression and anxiety in these patients. The differences in the rates of depression, anxiety and stress symptoms between the present study and others may be attributed to differences in the screening or diagnostic instruments employed, differences in awareness across populations, the socio-cultural discrepancy of the different study populations and their access for disproportionately differing advanced mental and medical treatment in developed countries. In terms of hypertension patients, the present study turned out to reveal the prevalence of depression, anxiety and stress to be 49.5%, 53.7%, & 32.6%, respectively. This finding further supports earlier studies as it has been observed significant high levels of depression, anxiety and stress levels in patients with hypertension. For example, in a comparable study conducted by researchers of [11] in 2014 in Ghanaian patients to assess mental health in hypertensive patients, the prevalence of depression was 4%, of anxiety disorders was reported to be 57%, and different levels of stress were found in 20% of patients. Authors in [5] showed that some degree of depression was present in almost half (46.0%) of patients treated for hypertension in their survey of 200 hypertensive patients in Sweden. Moreover, the study found the depression level to be mild in 29.0%, moderate in 10.5%, and severe in 6.5% of patients, which is in close proximity with current finding in which the percentages were 9.7, 19.4, 6, & 3.7 for mild, moderate, severe and extremely severe, respectively. In a nutshell, this study's finding of high prevalence of depression, anxiety and stress in hypertensive patients is remarkably congruent with several other similar conducted in different parts of the world. This can be attributed to the premise that these negative emotional states in turn may play a role in the development of hypertension, suggesting a causative link in a bidirectional fashion.

#### ***4.2. Differences in depression, anxiety and stress among NCD Patients***

By means of independent t-test statistic of the present study with regard to disease type, there exists no statistically significant depression, anxiety and stress mean score difference between diabetic and hypertensive patients. This finding augments the notion that both of the disease entities are significant contributing factors for compromised mental health in both types of patients. To the best of the researcher's knowledge, there was no ample studies available that aimed to examine the difference in the psychological aspects of diabetic and hypertensive patients which may be partly because of the putative association considered by researchers. The frequent co-occurrence of these two chronic medical illnesses and the grossly parallel patients' perception towards the diseases might have contributed to limited literature of such quality. That said, in relation with this,

while studying the 12-month prevalence and age/sex-adjusted odds of major depression by chronic conditions, author of [12] came with a congruent result regarding the psychological problems as a function of NCD type, who projected an odds ratio of 2.61 for any chronic medical condition, with OR report of 1.96 and 2.00 for diabetes mellitus and hypertension, respectively in comparison with the general population.

#### ***4.3. Association of potential risk factors with depression, anxiety and stress among NCD patients***

In this study and most other studies, higher prevalence rates of depression, anxiety and stress have been reported in diabetic women more than in diabetic men. In 2016, authors of [8] concluded higher susceptibility of females to psychological distress in the study done to determine the prevalence of depression, stress and anxiety in patients with type 2 diabetes mellitus as well as their association with demographic factors in Iran. Another comparable, cross sectional study conducted by authors of [13] in 2010 reported a male to female ratio of 1:3 in Nigerian diabetic patients, which is in line with the current study. Basically, women are physically and mentally more vulnerable than men; they are more susceptible against chronic illnesses both physiologically and psychologically, leading to a greater prevalence of mental disorders in them, including depression, stress and anxiety. Many factors such as socio-cultural, biological and hormonal factors are also implicated in this sex difference. Except for stress, where its highest level was seen in younger than 31-year patients, the results of this study showed that age has no significant relationship with anxiety and depression in NCD patients. Authors of [8] confirmed this partly by their study that showed that age has no significant relationship with stress, anxiety and depression in diabetic patients based in Iran. Nevertheless, while the current study finding shows stress levels to increase as the age gets down, a recent study by authors [14] showed that as age increases, depression and anxiety also increase in diabetic patients in Iran. It can be assumed that such discrepancies have resulted from differing methodologies employed by the studies conducted so far and the socio-cultural makeup of the studied population. A possible explanation for this discrepancy could be the fact that most of study participants of this particular study were in the 40-60 years age group. According to the present finding, married, divorced or widowed patients with non-communicable diseases possess relatively increased likelihood of having depression, anxiety and stress, taking single (unmarried) patients as references. This is in conjunction with the previous finding of authors of [15] in their study which was conducted to examine the prevalence and predictors of depression and anxiety in patients of diabetes mellitus in a tertiary care center. Their study found the prevalence rate of depression and anxiety was higher in married patients. This may be ascribed to the greater responsibilities on them such as managing their career aspirations and family responsibilities together, upbringing their children and most importantly managing the chronic illness like diabetes which adds to their financial and emotional burden. Even so, this finding is in contrast with the study [16] where it was found that the prevalence rate of depression is comparatively higher in single diabetic patients. In their study that aimed to assess the behavioral and clinical factors associated with depression among individuals with diabetes, the authors [16] found that marriage integrates people into wider social networks, buffers life from strains and provide personal security, meaningfulness, and purpose. Therefore, socio-cultural differences can be accountable for the inconsistencies. Although the wide confidence interval poses negative influence in the result (the strength of the evidence), low total monthly income per month (less than ETB 2000-5000) was significantly associated with a risk of having psychological distress particularly depression and anxiety. This finding harmonizes with the study of authors of [14] which was concerned with the prevalence rate of depression to be

higher in low income group. The researcher postulates this to be due to addition of stressors to the lives of patients, particularly to sustain every day's living expenditures as well as the already-costly medical treatment. However, it is to be remembered that the result of the analysis is less accurate which may be partly due to high data dispersion in terms of monthly income, and it needs to be interpreted carefully. According to the statistical findings of the current study, it can be concluded that the extent to which mental disorders happen in a diabetic person is not related to his/her educational background. In harmony with this particular finding of the study, authors of [7] documented that there was no significant relationship between stress, depression and anxiety in NCD patients, and their educational background in their study conducted in Pakistani population. The psychological state might also be influenced according to the informal or non-academic education or experience the patient may receive over time. Another explanation to be mentioned here is that the inclusion criteria of the study which favored patients who can at least read and write, which might have affected the study. A contentious finding by authors of [8] documented that people with higher education have lower levels of stress, depression and anxiety in Iranian diabetics. This may be due to the positive impact of higher education on the knowledge and successful management of self-care as well as prevention and care programs. In the present study, the correlation between duration of the illness and the experience of depression, anxiety and stress was pronounced by the finding that patients in their first five years of life with the chronic disease are more likely to have depressive symptoms compared to those who lived for more than ten years. The grossly inverse correlation between duration of the non-communicable disease and the expression of depressive symptoms in NCD patients in this study may be attributed to the fact that people adapt and establish a proper relationship with their illness over time, and come to an insight that diabetes mellitus and hypertension are no disease but unavoidable aspects of life for them. Again, in line with the findings of authors of [8] in 2016 in their similar research, the present study infers that there is no relationship between history of NCD and anxiety and stress. Likewise, authors of [14] found that the history of diabetes mellitus had no statistically significant relationship with depression and anxiety in their similar study in Iranian population. This insignificant association can be explained by the substantial resilience variations (for example, anxiety-prone personality) that exist in the study population. Taking the number of medication taken into consideration, patients who were taking three or five medications were shown to be 3.2 or 16.1 times more prone to develop depression symptoms compared to those who were taking only one medication a day, in this study. In a study conducted by authors of [5], which was done to examine the prevalence of depression in patients with hypertension in patients registered in a team of family medicine in the Health Centre Banja Luka, Sweden and to examine the effects of gender, duration of hypertension and other factors on the incidence of depression in these patients, a comparable finding was documented. In the previous study, the incidence of depression in patients was statistically significantly higher with increasing number of drugs included in chronic therapy. This compound finding is possibly due to the impression that patients are likely to be ordered by their physicians to take multiple drugs if they have poorly controlled diseases and that multiple medications are indirect indicators for the presence of other important medical condition being treated concomitantly. However, the current study found that patients taking four medications have shown lower odds of having depression according to the DAS-21 scale. This can be explained by the probability that the number of medications patients take can be simple medications for mild forms of medical comorbidities such as antidyspeptics or lipid-lowering prophylactic agents, and as such is not necessarily indicative of the severity of the disease. In a similar tone, patients taking combined medications are

likely to have better control of their disease potentially contributing to better mental states. This study also found that patients who didn't have positive family history of the chronic disease appeared to be 2.9 times more likely to have depression manifestations as measured by the DASS-21 screening tool. This is possibly attributable to the fact patients with positive family history might be psychologically prepared to contract the disease and that elder family members are likely to act as soothing agents & living witnesses for those late comers to the world of non-communicable diseases. However, findings of authors of [17] implied that patients with positive family history of the chronic disease are more likely to have symptoms of depression, anxiety and stress compared to those who hadn't, in their study which examined association between depression, anxiety and stress symptoms and glycemic control in Turkish diabetes mellitus patients. This can be plausible in situations where patients experience the grave impacts of the chronic diseases (including serious medical complications & premature loss) in a close family member at any point. On top of this, there might be tenacious sub-professional level of information sharing between the victims of the disease(s). According the result of the present study, patients with worse clinical stage of the chronic disease as reported by their clinicians retain significantly higher odds of having symptoms of depression, anxiety and stress. Nonetheless, on deeper inspection of the clinical stage segment of the multivariable analysis, the confidence interval is remarkably wide, and the broad CI gave negative impact on the result, i.e. the findings were less accurate. Therefore, caution needs to be exercised while interpreting this particular result. In juxtaposition with this, authors of [16], whose study aimed to examine the association between the negative mental states and glycemic control in Turkish diabetes mellitus population, stated that patients with non-optimal level of diabetes mellitus control had increased likelihood of expressing depression, anxiety and stress symptoms compared to the ones with relatively optimal control. This is inarguably natural as poor control may imply worse prognosis and it can also be underpinned by humans' fear of death. In the multivariate analyses, patients who did not exercise normally were 3.6 times more likely to experience anxiety than those who did. This finding was comparable to several previous findings and that of authors of [17], whose study investigated the association between depression, anxiety and stress symptoms and glycemic control in diabetes mellitus patients, which documented a similar elevated likelihood in Turkish diabetic population. This finding can be explained by the fact that patients with negative emotional features are less likely to have optimistic lifestyles & adaptive plans, thereby able to maintain healthy coping mechanisms such as physical exercise programs. Furthermore, regular physical exercise can help to optimize control measures of the chronic disease which in turn enhances the attendance of good mental states.

## **5. Limitations of the study**

This study has several potential limitations. Firstly, the patients were recruited through a single center i.e. Black Lion Specialized Hospital (and also due to the convenience sampling technique employed) and hence the results cannot be generalized to other patients with non-communicable diseases. Secondly, this study did not distinguish between different types of diabetes mellitus and hypertension. Moreover, the cross-sectional design of this study inevitably limits the capacity of the data to project a direction of causation in relation to NCDs and negative psychological states and has the disadvantage of being unable to establish the incidence rate of the mental health status of NCD patients; only the prevalence of the psychological distress among the patients can be determined. Another potential limitation to be pinpointed to the current study was use of the DASS-21 instrument which only determines the presence of depression, anxiety and stress symptoms, rather than



conducting a diagnostic interview which would have conclusively determined the prevalence of depression, anxiety and stress in the population. Finally, the researcher confesses that some of the DASS-21 items such as palpitation (item-19), trembling (item-7), and breathlessness (item-4) and dryness of mouth (item-2) can be mere symptoms of hypertension and/or low blood sugar level, which can inflate the total DASS scores, limiting its generalizability.

## **6. Conclusion**

The current study undeniably identified that considerable amount of depression, anxiety, and stress was noticeably prevalent among patients with NCDs, both diabetes mellitus and hypertension. It is plausible to conclude that patients with non-communicable disease(s) experience a compromised psychological state. There was no statistically significant difference between the two-types of non-communicable diseases examined in this study in experiencing the negative psychological symptoms. It can also be inferred that these negative mental profiles were related to a number of socio-demographic, lifestyle and clinical factors in one way or another. It should be noted that, among other factors, marital status and clinical stage of the disease were dependable predictors for appearance of depression, anxiety and stress in patients with NCDs.

## **7. Recommendations**

- Frontline clinicians handling non-communicable disease patients should work in close proximity with psychologists for early screening for the presence of negative emotional states and addressing them promptly, with particular attention for patients with predictor factors. Early intervention would be inarguably vital in halting the progress of the disease and improving their health-related quality of life. This would be more lucrative if particular emphasis is given to patients with poor level of control of their disease and those who are divorced or widowed.
- Taking into consideration the fact that the prevalence of non-communicable diseases is steadily soaring and comprehending the prevalence of depression, anxiety and stress in NCD patients would help in the designing and implementation of professional-based counseling and treatment options exclusively for the patients.
- Given the potential risks of psychological deterioration, and while awaiting rigorous further studies, the researcher suggests that concerned stakeholders create large-scale awareness regarding the essence of psychological aid in fostering the overall well-being of patients. This might go a long way in ensuring that clients can emerge as healthy productive citizens of the nation.
- It would be prudent for policy-makers to play their role by giving due emphasis for the psychological dimension of the holistic clinical care and active engagement of competent psychologists at different sockets of the clinical care. In other words, the government should set a platform where the health care system revolutionize to fashion itself in a manner that makes psychological therapy its vital element.
- Considering that the current study creates a meaningful insight into the burden of mental health among hypertensive and diabetic population, it could be underscored that grand prevention campaigns (through media and public health awareness programs) are unparalleled strategies to salvage the future generations from these non-communicable diseases which are important culprits for the prevalence of

psychological turmoil.

- More high-quality studies (with mixed approaches) examining these psychological issues prospectively are needed, in addition to the application of the findings contained in this study to other settings.

## Acknowledgement

I would like to thank Dr. Daniel Tefera who practically disqualified my long-time null hypothesis that there are no nice, quality people living on the surface of the Earth with a  $p$  value of  $<0.001$ . He also taught me that there is only one type of research: *good research*. I would also like to forward my warmest appreciation to Dr. Mulat Asnake, for teaching me to be scientific-minded, and for happily changing my thesis topic from: *The Magnitude of Plagiarism in Ethiopian Universities* and *Psychosocial Impacts of Inter-religious Marriages in Ethiopian Context* to the current one. Here, I candidly want to record my gratitude to Dr. **Asebe Abreham Alemayehu**, who pragmatically decided to sponsor the financial expenditure for the publication of the material, on the foreground of the panicking pandemic plague: *COVID-19*. He is simply a TRUE patriot! Finally, I would be remiss if I did not acknowledge my dog, namely *Gray matter*, who sat beneath my chair as I browse, synthesize, and analyze my paper to make it as superlative as it can be.

## References

- [1]. World Health Organization. (2014). "Global Status Report on Noncommunicable Diseases 2014." WHO. [On-line]. 1(1) Available: <https://apps.who.int/iris/handle/eam/10665/148114> [Nov. 15, 2018]
- [2]. D. DeJean, M. Giacomini, M. Vanstone, and F. Brundisini. (2013, Sep.). "Patient experiences of depression and anxiety with chronic disease: a systematic review and qualitative meta-synthesis," *Ont Health Technol Assess Ser.* [On-line]. 13(16), pp.1–33. Available: (<https://www.ncbi.nlm.nih.gov/pubmed/24228079>) [Dec. 4, 2018]
- [3]. O. Abegunde, D. Mathers, T. Adam, M. Ortegón, and K. Strong. (2007, Dec.). "The burden and costs of chronic diseases in low-income and middle-income countries" *Lancet.* [On-line]. 370, pp.1929-38. Available: [https://www.ncbi.nlm.nih.gov/pubmed/?term=Abegunde DO\[Author\]](https://www.ncbi.nlm.nih.gov/pubmed/?term=Abegunde+DO[Author]) [Nov. 17, 2018]
- [4]. A. Misganaw, D. Hailemariam, A. Ali and T. Araya (2014, Mar.). "Epidemiology of Major Non-communicable Diseases in Ethiopia: A Systematic Review." *J Health Popul Nut.,* [On-line]. 32(1), pp1-13 Available: <http://www.researchgate.net> [Nov. 24, 2018]
- [5]. S. Kosana, S. Mirko, J. Sanja, and C. Ivana. (2017, Feb.). "Prevalence of depression in patients with hypertension." *International Journal of Medical and Health Research.* [On-line]. 3(2), pp.16-21 Available: <https://www.ncbi.nlm.nih.gov/pubmed/30100841> [Nov.22, 2018]
- [6]. S. H. Lovibond and P. F. Lovibond, *Manual for the Depression Anxiety Stress Scales* (2<sup>nd</sup> edition). Sydney, N.S.W.: Psychology Foundation of Australia, 1995. Available: <http://www.worldcat.org> [Nov. 18, 2018]
- [7]. M. Mirzae, H. Daryafte, H. Fallahzadeh, and B. Azizi, (2016, Nov.). "Evaluation of depression, anxiety and stress in diabetic and non-diabetic patients." *JSSU.* [On-line]. 24(5), pp. 387-97. [In Persian] Available: [hehp.modares.ac.ir/article-5-4876-en.pdf](http://hehp.modares.ac.ir/article-5-4876-en.pdf) [Dec.23, 2018]
- [8]. H. Ahangari, B. Moasheri, E. Norouzi, and M. Shayesteh, (2016, Nov.). "The prevalence of stress,

- anxiety and depression in patients with type 2 diabetes and their association with demographic factors.” Health Education and Health Promotio. [On- line]. 4 (3). Available: [hehp.modares.ac.ir/article-5-4876-en.pdf](http://hehp.modares.ac.ir/article-5-4876-en.pdf) [Nov.22, 2018]
- [9]. N. Taheri, H. Hojjati, M. Mousavi, A. Afra, and B. Dehghan (2011, Mar.) “The Survey of Anxiety and Depression Prevalence in Diabetic Patient Referred to Abadan Taleghani and Khorramshahr Valiasr Hospitals.” JDN [On- line]. 1(2), pp. 21-31. Available: [johe.rums.ac.ir](http://johe.rums.ac.ir) [Dec.23, 2018]
- [10]. J. Kruse, N. Schmitz, and W. Thefeld. (2003, June). “On the association between diabetes and mental disorders in a community sample results from the German national health interview and examination survey.” JDC. [On- line]. 26(6), pp. 1841-6. Available: <https://www.ncbi.nlm.nih.gov/pubmed/12766120> [Nov.22, 2018]
- [11]. I. A. Kretchy, F. T. Owusu-Daaku, and S. A. Danquah, (2014, June). “Mental health in hypertension: assessing symptoms of anxiety depression and stress on anti-hypertensive medication adherence.” Int J Ment Health Syst. [On- line]. Pp. 8-25. Available: <https://www.ncbi.nlm.nih.gov/pubmed/24987456> [Dec.14, 2018]
- [12]. L. E. Egede. (2007, Oct.). “Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability.” General Hospital Psychiatry. [On- line]. 29(5), pp. 409-16. Available: <https://www.ncbi.nlm.nih.gov/pubmed/17888807> [Nov. 17, 2018]
- [13]. T. M. Agbir, M. D. Audu, T. O. Adebawale, and S. G. Goar, (2010, Apr.). “Depression among medical outpatients with diabetes: A cross sectional study at Jos University Teaching Hospital, Jos, Nigeria.” Ann Afr Med. [On- line]. 9, pp. 5-10. Available: <https://www.ncbi.nlm.nih.gov/pubmed/20418642> [Dec.23, 2018]
- [14]. N. Bafrooi, T. Dehghani, T. Firouzabadi, and B. Alizade. (2014, Dec.). “Prevalence of Depression and Anxiety in Patients with Diabetes.” JDN. [On- line]. 2(4): 60-8. [In Persian] Available: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4636748/> [Dec.14, 2018]
- [15]. R. Rajput, P. Gehlawat, D. Gehlan, R. Gupta, and M. Rajput, (2016, Oct.). “Prevalence and predictors of depression and anxiety in patients of diabetes mellitus in a tertiary care center.” Indian J Endocrinol Metab. [On- line]. 20(6), pp. 746–751. Available: <https://www.ncbi.nlm.nih.gov/pubmed/27867873> [Dec.23, 2018]
- [16]. W. Katon, M. von Korff, P. Ciechanowski, J. Russo, E. Lin, G. Simon, et al. (2004, Apr.). “Behavioral and clinical factors associated with depression among individuals with diabetes.” Diabetes Care. [On- line]. 27(4), pp. 914-920 Available: <https://www.ncbi.nlm.nih.gov/pubmed/15047648> [Nov.24, 2018]
- [17]. A. Bener, M. Ozturk, and E. Yildirim, (2017, April). “Association between Depression, Anxiety and Stress Symptoms and Glycemic Control in Diabetes Mellitus Patients.” Int J Clin Endocrinol. [On- line]. 1(1), pp. 001-007. Available: [https://pdfs.semanticscholar.org/cb45/ea0ed19dce9f8f921911db25d6030\\_a110350.pdf](https://pdfs.semanticscholar.org/cb45/ea0ed19dce9f8f921911db25d6030_a110350.pdf) [Dec1.4, 2018]