THE EFFECT OF HYPERTENSION IN PEOPLE DIAGNOSED WITH DEPRESSION IN PRIMARY HEALTH CENTER CLINICS IN AL-KHOBAR, SAUDI ARABIA

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Masters Dissertation to obtain the Master's Degree in Primary Care Mental Health

NOVA Medical School | Faculdade de Ciências Médicas

16/05/2018

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Acknowledgments

I would like to show my gratitude to Professor Lucja Kolkiewicz and thank her for advice, encouragement, and being patient with me. I did not hesitate to contact her and encourage me to ask questions. Also, I would like to thank Dr. Sara Al- Dosary and Dr. Abdulrahman Alharbi who helped me in the dissertation.

Special thanks for Primary mental health program team for their great contributions in collecting Data. Last but not least, Dr. Maha our biostatistician, she contributed to the dissertation in a big way and guided me in the analysis of the data and was a great addition to the dissertation.

I would also like to express my appreciation to Professor Gabriel Ivbijaro and Dr. Abdullah Al-Khathami for helping me selecte the subject of the dissertation.

Finally, I would like to express my sincere thanks and appreciation to the faculty of the University of Nova Lisbon for providing advice and assisting us in complete this dissertation and helping me obtain a Master's degree.

Abstract:

Introduction: In Saudi Arabia, both hypertension and depression are a major health problem and comorbidity is not rare. Depressive symptoms have been shown to be strong independent predictors of cardiac mortality more than hypertension alone (2).

The aim of this study is to assess the effect of hypertension on Primary Health Care (PHC) depressive patients to determine the relationship between these comorbid medical conditions and determine if one hinders the management of the other .

Method: This cross-sectional survey of 185 PHC patients was conducted in AL Khobar City, Kingdom of Saudi Arabia from March 01, 2017 to April 01, 2017, using a self-administered questionnaire and medical record (files) review of all patients who completed the questionnaire.

Results: Fifty eight (31%) out of 185 participants, were diagnosed with comorbid depression with hypertension. The mean age of total participants was 44.7 ± 11.6. The depressive patients with hypertension were older than who hasn't hypertention with significant value (p-value 0.011) a quarter of them were illiterate, 20(34,5%). Patients who only finished primary level of education or less were more prone to depression with hypertension with p-value 0.047 which is significant. As regards BMI, SBP, and DBP of the hypertensive participants was 33.7 ± 11.6, 134.5 ± 15.8, and 82.4 ± 11.2, respectively which is highly significant. Meanwhile, BMI, SBP, and DBP in the depressive participants without hypertension was 29.7 ± 6.6, 119 ±14.9, and 72.3 ± 8, respectively which is highly significant. The Odds ratio of feeling tired among depression with hypertension is 2.136 times more than the depression without hypertension with Confidence Interval (CI) (1.118 – 4.081). The Odds ratio of loss of appetite among depression with hypertension is 1.959 times more than the depression without hypertension with Confidence Interval (CI) (1.045 – 3.674).

Conclusion: Age and being illiterate have a significant relation with depression and hypertension. Also greater role was found to be related to multiple factors associated with depression and hypertension DPB,SBP and BMI. Further study with a larger sample to assess the relation between uncontrol hypertension and the level of depression is recommended.

نبذة مختصرة للدراسة

المقدمة: في المملكة العربية السعودية، يعتبر كل من مرض ارتفاع ضغط الدم والاكتئاب مشكلة صحية كبيرة والاعتلال المشترك بينهما ليس نادرا. وقد تبين أن أعراض الاكتئاب يكون مؤشرا مستقلا قويا لوفيات القلب أكثر من ارتفاع مرض ضغط الدم وحده (٢). الهدف من هذه الدراسة هو تقييم تأثير مرض ارتفاع ضغط الدم على المرضى الذين يعانون من الاكتئاب في الرعاية الصحية الأولية حيث أنه من الضروري تحديد العلاقة بين هاتين الحالتين الطبيتين للتأكد من أن أحدهما لا يعوق معالجة الآخر وتقييم الاعتلال المشترك للاكتئاب مع مرض ارتفاع ضغط الدم ما إذا كان يجعلها أسوأ أم لا.

الطريقة: أجريت هذه الدراسة على185 مريضا من مرضى الرعاية الصحية الأولية في مدينة الخبر بالمملكة العربية السعودية في الفترة ما بين مارس وأبريل 2017 م من خلال تعبئة استبيان ذاتي ومراجعة السجلات الطبية (الملفات) لجميع المرضى الذين ملأوا الاستبيان.

النتائج: من أصل 185 مشاركا، تم تشخيص (31%) 58 منهم كمرضى مصابين بالاكتئاب مع مرض ارتفاع ضغط الدم. وكان متوسط عمر المشاركين الكلي 11.6 ± 44.7. المشاركين المصابين بمرض الاكتئاب مع مرض ارتفاع ضغط الدم كانوا أكبر عمرا من مرضى الاكتئاب من غير مرض ضغط الدم مع قيمة احتمالية عالية جدا (p-value 0.011) وكان ربعهم أميين، (34,5%)20. المرضى الذين حصلوا فقط على التعليم الابتدائي أو أقل كانوا أكثر عرضة للإصابة بالاكتئاب مع مرض ارتفاع ضغط الدم مع قيمة احتمالية عالية. فيما يتعلق بمؤشر كتلة الجسم و، ضغط الدم الانقباضي، وضغط الدم الانبساطي لدى المشاركين في المصابين بمرض ارتفاع ضغط الدم كان 11.2 ,± 82.4 and 15.8 ,± 134.5 11.6 ,± 33.7، على التوالي وهو ذو قيمة احتمالية عالية جدا. في الوقت نفسه، كان مؤشر كتلة الجسم، ضغط الدم الانقباضي، وضغط الدم الانبساطي في المشاركين المصابين بمرض الاكتئاب دون مرض ارتفاع ضغط الدم 8 ± 72.3 ,14.9± 119 ,6.6 ± 29.7، على التوالي وهو ذو قيمة احتمالية عالية جدا. نسبة الارجحية (Odds ratio) من الشعور بالتعب بين مرضى الاكتئاب مع مرض ارتفاع ضغط الدم هو 2.136مرات أكثر من مرضى الاكتئاب دون مرض ارتفاع ضغط الدم مع فترة الثقة (CI) (1.118 – 4.081) . نسبة الارجحية (Odds ratio) من فقدان الشهية بين مرضى الاكتئاب مع مرض ارتفاع ضغط الدم هو 1.959مرات أكثر من مرضى الاكتئاب مع فترة الثقة (CI) (1.045 – 3.674)

الخاتمة: العمر والأمية لهما علاقة كبيرة بالاكتئاب ومرض ارتفاع ضغط الدم. كما وجد ان هناك عدة عوامل تؤثر على المرضى المصابين بمرض الاكتئاب مع مرض ارتفاع ضغط الدم كضغط الدم الانبساطي، وضغط الدم الانقباضي، ومؤشر كتلة الجسم. وقد أوصينا بإجراء دراسة أخرى مع عينة أكبر لتقييم العلاقة بين مرض ارتفاع ضغط الدم غير المنضبط ومستوى الاكتئاب.

Keywords: Depression with hypertension; depression without hypertension;

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List of abbreviations:

MOH: Ministry of Health

PHC: Primary health care

SPSS: Statistical package for the social sciences

WHO: World Health Organization

HTN: hypertension

D+HTN: Depression with hypertension

D-HTN: Depression without hypertension

BP: blood pressure

SBP: Systolic blood pressure

DBP: Diastolic blood pressure

Odds ratio: a measure of association between depression with hypertensive and depression without hypertension

Confidence Interval (CI): used to estimate the precision of the Odds ratio

Introduction

Comorbidity between depression and physical illness is common. Studies show that depression exacerbates the effects of medical conditions more than the effects of individual diseases (1). Studies have indicated that depression is often associated with hypertension (2). There are many possible pathways through which depression may lead to hypertension, but the two most common are unhealthy behaviors and mental problems (3).

Hypertension is an important risk factor for cardiovascular disease and may be more prevalent in people with mental illnesses (4). The relationship between hypertension and depression is still debatable. Although several studies have been completed, the results are conflicting. Some studies report an increase in the rate of hypertension among people with depressive disorder, while other studies found no relationship between hypertension and depression. Meanwhile, other studies reported low blood pressure in patients with depression (5).

In Saudi Arabia, both hypertension and depression are considered major health problems, and comorbidity is not rare. The prevalence of hypertension in Saudi Arabia is 27.2% among those aged 30 or older, and hypertension is uncontrolled in 55.0% of those on treatment. Moreover, 17%–46% of patients presenting in primary health care clinics have depression (6).

Depressive disorders account for a large proportion of the global burden of disease and are leading causes of various health problems in the modern society. Depressive disorder is expected to be the second most common cause of disability by 2020 as reported by the World Health Organization (7).

According to a recent report, depression will become the second most common health problem in the world because of the emerging lifestyle changes (2). Evolving technology is changing the normal lifestyle, and people are working extra hard to meet new lifestyle needs. Increasing cases of single parenting, divorce, tough economic conditions, joblessness, and family pressure are likely to increase levels of depression, particularly among those aged 30 years or older (8). According to a recent study, the

problem that medical practitioners face when dealing with depression is that most patients often ignore it (6).

Rationale for the study

A recent study showed that mental disorder, particularly depression, causes a number of health-related problems, including hypertension (9). Several studies on the mechanism by which depression leads to hypertension or causes other diseases have been conducted (10) however, little attention has been given on how other health problems may cause depression.

Depression can be very disruptive not only on one's health, but also in other aspects of life such as treatment adherence, lifestyle, and smoking habits (10). As soon as a person starts treatment, necessary precautions should be taken to eliminate factors that may affect the recovery process.

Several previous studies have demonstrated that depression is among the several factors that determine the level of hypertension control (11). Depressive symptoms have been shown to be strong independent predictors of cardiac mortality, more than hypertension alone (2), worse health status, increased mortality and morbidity, uncontrolled hypertension (4), poor compliance (12), and increased health care utilization and follow-up (11).

Hypertension may also have a negative emotional effect on patients, increasing the risk of developing mental disorder, particularly depression, which in turn may slow the rate of recovery or adherence to medication (13). This study is of importance to determine the relationship between these two co-morbid medical conditions to ensure that one does not hinder management of the other.

Research question

Does comorbid hypertension and depression worsen depressive symptoms?

Aim

To assess the effect of hypertension on patients with depression at the primary health care setting**.**

Study objective

To evaluate the effect of hypertension on depression

Literature review

A study evaluating the associations between hypertension and comorbid anxiety-depression was conducted in Africa in 2009. This cross-sectional survey of mental health patients between 2002 and 2004 targeted adults aged 18 years and older who were available during the study. Hypertension and mental disorder was assessed using a questionnaire and the Diagnostic and Statistical Manual of Mental Disorders (DSM)-VI criteria, respectively. In this study population, 16.7% of participants reported a previous medical diagnosis of hypertension, and 8.1% and 4.9% were found to have a 12- month anxiety or depressive disorder, respectively. In adjusted analyses, hypertension diagnosis was associated with 12-month anxiety disorder (odds ratio [OR]=1.55, 95% confidence interval [CI]=1.10–2.18), but not with 12-month depressive disorders or 12-month comorbid anxiety-depression. Hypertension in the absence of other chronic physical conditions was not associated with any of the 12-month mental health outcomes (all P-values, 0.05), while being diagnosed with both hypertension and another chronic physical condition was associated with 12-month anxiety disorders (OR=2.25, 95% CI=1.46–3.45), but not 12-month depressive disorders or comorbid anxiety-depression. They concluded that there is a high prevalence of hypertension and mental health problems in their study setting and that the comorbidity between chronic physical conditions and mental disorders is also present in the South African context (14).

Another a prospective open-cohort study was initiated by the National Institute on Aging in 1958. Volunteers return every 2–3 years to Harbor Hospital in Baltimore, Maryland, for physiological and psychological testing. Beginning in 1979, participants were assessed using the Center for Epidemiologic Studies–Depression (CES-D) scale. The final analysis sample included 2,087 participants comprising 1,095 men and 992 women aged 19 to 97 years. At each visit, a trained member of nursing staff measured brachial blood pressure (BP) in both arms, and participants completed the CES-D, which was used in the survey to measure the current depressive symptomatology levels and to examine the relation between depressive symptoms and other variables. The domains covered included depressive mood, feelings of guilt or worthlessness, loss of appetite, sleep disturbance, and psychomotor retardation. The results of mixed-effects regression analysis revealed that prospective relations of CESD (log) to DBP differed by age in

women (b=0.095; P=0.001) but not in men. Greater CES-D (log) attenuated the expected age-related decline in SBP. Across all testing sessions, greater CES-D (log) was associated significantly with higher average SBP for women (b=2.238; P=0.006) but not in men. Age-stratified analyses showed that greater CES-D (log) was significantly associated with higher average SBP (b=3.348; P=0.02) and DBP (b=1.730; P<0.03) for older adults (≥58.8 years at first visit). In the younger age cohort, sex moderated the relation of CES- D (log) to SBP (b=−3.563; P=0.007). Greater CES-D (log) in women, but lesser CES-D (log) in men, was associated with higher SBP. Their results demonstrated sex and age differences in the relation between depressive symptoms and BP. Their findings indicated the importance of preventing, detecting, and lowering depressive symptoms to prevent hypertension among women and older adults (15).

A case-control study done in two hospitals in Karachi in Pakistan in 2014 investigated the association between uncontrolled hypertension and anxiety and depressive disorders. It included patients with uncontrolled and controlled hypertension, with the latter considered as controls. History of anxiety or depression was measured via the Hospital Anxiety and Depression Scale (HADS). A HADS score of 8 was considered an indication of anxiety or depression. Initially, 700 participants were approached, out of whom 590 fulfilled the inclusion criteria and consented to participate. A total of 323 (54.7%) and 267 (45.3%) participants were enrolled as cases and controls, respectively. The mean (SD) age was 54.98 (12.38) years, and 229 (38%) were men. The OR (95% CI) of having uncontrolled hypertension and being depressed (HADS-D48) was 2.02 (1.44–2.83), P=0.001. The association remained significant even after adjusting for age and gender in model 1 OR (95% CI): 1.82 (1.27–2.60), P value¼ 0.001; ethnicity and education in model 2 OR (95% CI): 1.87 (1.29–2.71), P value¼0.001; and comorbidity, history of hospitalization, and body mass index in model 3 OR (95% CI): 1.94 (1.31–2.85), P value¼ 0.001. They concluded that uncontrolled hypertension is associated with depression independent of sociodemographic factors, comorbidity, and history of hospitalization (4).

A longitudinal observational study and population-based health survey in Quebec, Canada aimed to identify the determinants of antihypertensive medication adherence in community-living elderly adults. The data were collected from a

representative sample (n=2,811) of community-dwelling adults in Quebec aged 65 and older participating in the E ´tude sur la Sante ´ des Aı ˆne ´s study. The final study sample analyzed consisted of 926 participants taking antihypertensive drugs during the 2 years of the study. They measured the adherence to antihypertensive medication by using days of supply obtained during a specified period. They assessed the depression and anxiety disorders by using the DSM-IV criteria, and physical health status was measured using the Charlson Comorbidity Index. Other factors considered were age, education, marital status, annual family income, and number of antihypertensive drugs used. The mean antihypertensive proportion (percentage) of days supplied in Years 1 and 2 was 92.5% and 59.4%, respectively. The presence of depression and anxiety disorders and the number of antihypertensive medications significantly predicted medication adherence. The difference in correlation between depression and anxiety disorders as classified according to sex was significant. They concluded that adherence to antihypertensive medication was significantly associated with depression and anxiety disorders in men but not in women. The treatment of depression and anxiety disorders in individuals with hypertension may be helpful in improving medication adherence (16).

The Gutenberg Health Study (GHS) was a cross-sectional population-based study from April 2007 to October 2008 in the Rhein–Main region in western Mid-Germany. A total of 48.6% of participants were classified as “no HTN,” (hypertension) 13.5% had controlled HTN, 23.4% had uncontrolled HTN, and 14.2% were unaware of their HTN. Unawareness of HTN was inversely associated with burden of depression. Controlled HTN was positively associated with depression. However, this association was due to generally increased disease burden (e.g., stroke and diabetes). The severity of cognitive symptoms of depression was negatively associated with SBP (systolic blood pressure) in persons that did not take antihypertensive drugs (b¼_0.64, P¼ 0.0005). Intake of beta-blockers and medications acting on the renin–angiotensin system was associated with severity of somatic symptoms of depression (17).

A secondary analysis of a prospective cohort study derived. data were from 2 previously published studies, namely, the Carolina African American Twin Study of Aging and the Baltimore Study of Black Aging. They analyzed the SBP and found a correlation between depression and hypertension (r=–0.086, P=.010), SSOUT and hypertension

(r=0.082, P=0.014), and perceived stress and hypertension (r=–0.101, P=0.002). They found a negative relationship between perceived stress/depression and hypertension, that is, as a person experiences a greater level of stress/depression, the BP also decreased. Meanwhile, a positive relationship was observed between ssout (Social Support given to others) and hypertension (r=0.091, P=0.008). Social support received was not found to be related to hypertension (r=–0.061, P=0.066). Correlation analysis for diastolic blood pressure demonstrated a significant positive relationship between depression (r=0.096, P=0.004) and perceived stress (r=0.069, P=0.04). Negative relationships between perceived stress (R2=0.037)/depression (R2=0.033) and hypertension were observed. SBP was found to be significantly correlated with depression, thus demonstrating that depression can be a predictor of hypertension that is partially mediated by the given social support (18).

A study conducted between February and September 2011 assessed whether a diagnosis of depression is associated with clinical inertia in patients with uncontrolled hypertension. The study comprised 28 non-trainee primary care providers (PCP) and 158 patients with uncontrolled hypertension from two inner-city, academic hospital-based primary care clinics. Patients aged ≥18 years old, prescribed one or more BP medications, and had a BP of ≥140/90 mmHg (or ≥130/80 mmHg if diabetic or with chronic kidney disease) on at least two consecutive scheduled visits with their PCP were included in the study. Depression was assessed based on PCP documentation in the electronic medical record. The predictors of clinical inertia on current visit, age, sex, current visit SBP, prior visit SBP, number of BP medications, number of medical problems addressed during the visit, diabetes status, and medication adherence (Morisky Medication Adherence Scale) either from the medical record or by a physician or, in the case of medication adherence, by interviewing patients following the clinic visit were assessed. The mean patient age (SD) was 64.5 (8.8) years; 74.1% were women, 79.1% were Hispanic, 44.9% were diagnosed with depression, and 61.2% had diabetes. On average, participants had a prior visit SBP of 158.7 (15.7) mmHg, current visit SBP of 154.6 (16.7) mmHg, were taking 2.5 (1.1) BP medications, and had 5.3 (2.3) problems addressed during the visit. Clinical inertia was more common among depressed than non-depressed patients (70% vs. 51%; P=0.015). Depression diagnosis was associated

with clinical inertia in both the adjusted and unadjusted multilevel analyses (relative risk [RR]=1.40; 95% CI: 1.11–1.74; P=0.004; adjusted relative risk [ARR]=1.49; 95% CI: 1.06–2.10; P=0.021). The association remained after excluding those with at least one documented home or clinic visit SBP below goal (ARR=1.74; 95% CI: 1.07–2.83; P=0.025), adjusting for adherence counseling (ARR=1.49; 95% CI: 1.10–2.04; P=0.010), and excluding diabetics with SBP ≤140 mmHg (ARR=1.49; 95% CI: 0.99–2.23; P=0.057) (19).

Research conducted in two outpatient family clinics in Rijeka to determine whether the concurrent administration of antidepressants with antihypertensive leads to better regulation of BP in patients with hypertension and increased depressiveness. The study population comprised 452 patients with arterial hypertension who had not been diagnosed with depression prior to the study. Hypertension was diagnosed according to the European Society of Hypertension and the European Society of Cardiology Guidelines for the Management of Arterial Hypertension. The Beck Depression Inventory and the ICD-10 criteria were used to diagnose depression. A total of 134 hypertensive patients with depression were selected. Of these, 73 received antidepressants together with antihypertensive for 24 weeks (experimental group). The rest of the patients (n=61) continued to receive antihypertensive alone (control group). At the end of the 24-week therapy, the experimental group had significantly lower levels of both systolic and diastolic blood pressure (Z=7.42; P<0.001; and Z=7.36; P<0.001). No significant difference between the level of BP (both systolic and diastolic) prior to and after the 24-week period was noted in the control group. This study showed that the addition of antidepressant therapy in patients with hypertension who are also depressed may be associated with better control of BP, which reduces the risk of cardiovascular disease in addition to alleviating depressive symptoms (20).

A study was conducted in Showa University Hospital during a 2-year period from November 2011 to October 2013 to determine the effects of depression and/or insomnia on Masked hypertension (MHT) compared with other types of HTN and on variability in Home-measured blood pressure (HBP) and Clinic BP (CBP). A sample of 328 hypertensives patients (132 women) aged 68±10 years were classified into four groups according to BP types based on CBP (140/90 mmHg) and morning HBP (135/85 mmHg) measurements: controlled HT (CHT), white-coat HT, MHT, and sustained HT (SHT). They

diagnosed depression using the Center for Epidemiologic Studies Depression Scale (CES-D), where a score of ⩾16 on was defined as depression. The risk of depression was 2.77-fold higher in the SHT (sustained HTN) group and even higher in the MHT (Masked HTN) group (7.02-fold). The association between depression and MHT was increased by insomnia and was somewhat stronger in women. Both morning and nighttime HBP variability was significantly higher in depressive patients than in non-depressives. These results suggest that depression is associated with MHT and that it increases both morning and nighttime HBP variability but not CBP variability. Therefore, they concluded that physicians should consider mental stress such as depression in their hypertensive patients when planning to control BP over the diurnal cycle (9).

A study of the civilian noninstitutionalized US population between 1971 and 1975 was conducted to explore the relationship between depression and hypertension incidence between 1982 and 1992 among participants in the Epidemiologic Follow-up Studies of the First National Health and Nutrition Examination Survey (NHANES I by conducting multivariate longitudinal (1982–1992) analyses stratified by age (n=4,913) using Cox proportional hazards models. They found that middle-aged subjects who suffered from depression at baseline were 44% more likely to be diagnosed with hypertension over the follow-up period after controlling for covariates (hazard ratio [HR]=1.44, 95% CI: 1.15–1.80). Both short sleep duration and insomnia were also significantly associated with hypertension incidence. Consistent with insomnia and sleep duration acting as mediators of the relationship between depression and hypertension incidence, the inclusion of these variables in the multivariate models notably attenuated the association (HR=1.27, 95% CI: 1.00–1.61). Depression, sleep duration, and insomnia were not significantly associated with the incidence of hypertension in elderly subjects. They concluded that treatment of sleep problems in middle-aged individuals with depression can reduce their risk for developing hypertension and its vascular and cardiac complications (10).

An observational study was done in USA to evaluate the rates and predictors of incident hypertension control among patients with anxiety and/or depression compared to patients without either mental health diagnosis. It was a four-year retrospective analysis that included 4362 patients with anxiety and/or depression aged ≥18 years old

who received primary care in a large academic institution from 2008 to 2011. Of the 4362 identified patients, 573 (13%) fulfilled the inclusion criteria and consented to participate. Compared with those without anxiety and/or depression, patients with these diagnoses were younger, women, single, current or former tobacco users, and more likely to have received Medicaid benefits. Patients with anxiety and/or depression had a faster rate of hypertension control than those without the condition (HR: 1.22; 95% CI: 1.07–1.39). Other factors associated with faster hypertension control include female sex, no history of tobacco use, receiving Medicaid at least once, and a higher Adjusted Clinical Groups risk score. Overall, 13% (n=573) had a baseline diagnosis of anxiety and/or depression. The study concluded that the rate of primary care and specialty visits was higher among those with anxiety and/or depression than those without either condition, which may contribute to faster hypertension control (11).

A hospital-based cross-sectional study was performed to ascertain the prevalence and role of negative emotions on anti-hypertensive medication adherence while considering patients' belief systems. The study involves 400 hypertensive patients in two tertiary hospitals in Ghana. Hypertensive patients experienced symptoms of anxiety (56%), stress (20%), and depression (4%). A significant correlation was observed between spiritual beliefs as a coping mechanism and anxiety (x2=13.352, P=0.010), depression (x2=6.205, P=0.045), and stress (x2=14.833, P=0.001). Stress among patients increased their likelihood of medication non-adherence (OR=2.42 (95% CI: 1.06–5.5), P=0.035). The study demonstrated that physicians need to consider negative emotions and their role in medication non-adherence. The study recommended that attention should be directed toward the use of spirituality as a possible mechanism by which negative emotions could be managed among hypertensive patients (13).

Another study was conducted within the CVRN (Cardio Vascular Research Network) Hypertension Registry. It included all adult patients with hypertension at three large integrated healthcare delivery systems, namely, Health Partners of Minnesota, Kaiser Permanente Colorado, and Kaiser Permanente Northern California. They performed multivariable survival analysis of time to detection and recognition in patients who entered the registry in 2002–2006 to determine whether disparities exist in the detection of elevated BP and diagnosis or treatment of hypertension in patients

with depression and anxiety. The study comprised two groups in time of detection of elevated BP and recognition of hypertension in patients with anxiety and depression and compared them with patients without anxiety or depression. Using data from cardiovascular research network hypertension registry, they found 168630 incident hypertension patients. In this cohort, hypertension was detected earlier among patients with anxiety and depression compared with patients without these diagnoses, while recognition of hypertension within 12 months of the second elevated BP was similar or delayed. They concluded that elevated BP was detected earlier in patients with anxiety and depression, and the time from detection to diagnosis or treatment was similar or delayed in patients with and without these diagnoses. Their findings suggest that as-yet-unidentified factors contribute to disparities in hypertension detection and recognition (21).

Another study aimed to examine whether the occurrence of depression influences the adherence to antihypertensive medication (AHM) among chronically hypertensive patients from 1995 to 2005 by employing multiple repeat measurements of reimbursed AHM prescriptions over a 9-year follow-up covering both pre-depression and post-depression phases. The analyses were based on data gathered from a longitudinal cohort of Finnish employees (The Finnish Public-Sector Study). A total of 852 men and women who were chronically hypertensive at baseline with a recorded onset of depression during the 9-year observation window and 2359 hypertensive control participants matched for age, sex, socio-economic status, time of study entry, employer, and geographic area were included in the study. Individuals with any sign of depression within 4 years before the beginning of the study were excluded. To describe long-term trajectories (4 years before and after the recorded depression) of AHM adherence in relation to the onset of depression, annual data on reimbursed AHM prescriptions were gathered from the national Drug Prescription Register. Annual nonadherence rates (i.e., number of “days-not-treated”) were based on filled prescriptions. Among the male participants, the rate of “days-not-treated” was 1.52 times higher (95% CI: 1.08–2.14) in the years after the onset of depression compared to pre-onset levels. In female and male controls, no change in adherence to AHM was

observed between these times. They concluded that in hypertensive men, the onset of recorded depression increases the risk of nonadherence to AHM (22).

A study was conducted in Norway to prospectively estimate the effect of anxiety and depression on change in BP 11 years later within the same population. Data on 36,530 men and women aged 20–78 years participating in the Nord-Trøndelag Health Study (HUNT) in Norway in 1984 to 1986 were re-examined 11 years later. Twelve questions on anxiety and depression were included in the baseline questionnaire, consisting of a one-dimensional anxiety and depression symptom index (the ADI–12 Index) that correlated strongly (r=0.82) with the Hopkins Symptoms Checklist– 25 in a subsample re-examined 2 years after baseline screening. The test–retest correlation over 2 years for the ADI–12 Index was considered good (r=0.66). Five of the ADI–12 items corresponded with ICD–10 criteria of depressive episode, and three items corresponded with ICD–10 criteria of generalized anxiety disorder. Specially trained nurses measured the BP of participants placed in a seating position after 4 min (baseline) and then 2 min after the first measurement (follow-up). The second reading was used in this study. They found that a high symptom level of anxiety and depression at baseline predicted low SBP (<10th percentile) at follow-up (OR=1.30, 95% CI 1.08–1.57) when those with low SBP at baseline were excluded. Changes in symptom level of anxiety and depression between baseline and follow-up were inversely associated with changes in SBP. For diastolic blood pressure, the findings were weaker or non-significant. The study concluded that symptoms of anxiety and depression predicted lower BP 11 years later and that low BP was associated with symptoms of anxiety and depression. Both the increase in symptom load from baseline to follow-up and a high baseline symptom load predicted a decrease in BP. These associations were found in both sexes; were independent of baseline BP, age, and other risk factors usually associated with hypertension; and were not explained by the use of antidepressant or antihypertensive medication (23).

A cohort study was conducted in 20 to 70-year-old patients from clinics at the Department of Family Medicine, University of Wisconsin at Madison and the Wisconsin Research and Education Network to evaluate the effects of symptoms of depression and anxiety on adherence to antihypertensive drug treatment. Patients with essential

hypertension who had been taking medication for up to 1 week, without other chronic conditions, and not taking mood-modifying drugs were selected. The severity of symptoms of depression and anxiety was evaluated using the Beck Depression Inventory-II (BDI-II) and the Psychological General Well-being Index (PGWB), respectively. Treatment adherence was evaluated via pill count. Nonadherence was defined as taking <80% of the prescribed number of pills. A total of 178 patients were included in the study (58% men; mean age: 50 years; 508 follow-up visits). The risk of nonadherence was 52.6% in 12 months (95% CI: 46.1–59.1). After adjusting for other risk factors, individuals with at least mild depression (BDI-II ≥14) and those with at least mild anxiety (PGWB anxiety score <22) were 2.48 (95% CI: 1.47–4.18) and 1.59 (95% CI: 0.99–2.56) times more likely to become nonadherent in the following 3 months, respectively. The study has demonstrated that patients with symptoms of mild anxiety and depression are at high risk of nonadherence to antihypertensive medication (12).

A cross-sectional study was done Al-Khobar City, KSA between April and May 2015 to evaluate the prevalence and severity of depression and anxiety and identify the risk factors for treatment nonadherence among chronic disease patients. The study was conducted in all chronic diseases clinic of the Ministry of Health (MOH) in the city. A random sample of 368 PHC patients were included. PHQ-9 and GAD-7 were used as diagnostic tools for depression and anxiety. They found that sleep disturbance has a high specificity (98.9%) in screening for depression. Depression or anxiety was detected in 23% of all cases, and the overall prevalence of depression or anxiety was 57.3%. A total of 48.7% of patients had depression (39.8% mild, 7.1% moderate, and 1.8% severe), while 38.4% had anxiety (25.1% mild, 8.8% moderate, and 4.4% severe). The rate of co-existence of both disorders was 29.5%. Sleep disturbance, weight change, and low income had an independent significant effect on depression and anxiety. The study has demonstrated that patients with chronic disease who do not report sleep disturbance are unlikely to have a comorbid diagnosis of anxiety or depression. Their findings indicated that patient's feelings should be considered in chronic diseases health care plans (24).

A cohort study was done in England (2014) to evaluate the association between symptoms of anxiety and depression across adult life and BP in late middle age. Data of 1683 participants from the Medical Research Council National Survey of Health and

Development (MRC NSHD) survey were used. The associations between affective symptoms at ages 36, 43, 53, and 60–64 years and SBP and DBP at age 60–64 were investigated. They found lower SBP in participants with case-level affective symptoms at one to two time-points (-1.83 mmHg; 95% CI: -3.74–0.01) and at three to four time-points (-3.93 mmHg; 95% CI: -7.19–-0.68) compared with those never meeting affective case criteria, suggesting a cumulative inverse impact of affective symptoms on SBP across adulthood (P value for trend: 0.022). Sex and BMI had a substantial impact on the estimates, but not other confounders. Potential mediators such as heart rate and lifestyle behaviors had minimal impact on the association. SBP at age 36 and behavioral changes across adulthood, as additional covariates, also had minimal impact on the association. A similar but weaker trend was observed for DB. The study has demonstrated that the effect of symptoms of anxiety and depression across adulthood results in lower SBP in late middle age that is not explained by lifestyle factors and antihypertensive treatment (5).

A study was conducted in México in 2013 to determinate whether depression interferes with BP control in hypertensive patients. They selected 40-hypertensive patients taking antihypertensive treatment, excluding beta-blockers and central-acting agents, who self-measured their BP several times a day for three days using a validated, commercially available device. All patients also completed the Zung Self-Rating Depression Scale survey for depression. Associations between the results of BP and depression tests were determined using the Spearman correlation coefficient, and they measured RR (Relative Risk). Of the 40 patients, 23 were depressed, and 21 out of these 23 had poor BP control. The RR for uncontrolled hypertension in depressed patients was 15.5. A significant correlation between systolic (r=0.713) and diastolic (r=0.52) BP values and depression was found. The study demonstrated depression is common in uncontrolled hypertension and may restrict BP control. They recommended screening of depression in hypertensive patients to improve patient outcomes (25).

A cross-sectional study was conducted from August 5 to October 4, 2011 to assess the prevalence of undiagnosed (subclinical) depression and associated risk factors among hypertensive patients attending a tertiary health care clinic in Nepal. The study included 321 hypertensive patients, and BP was measured via a mercury column

sphygmomanometer and then recorded. They assessed the depression levels by using the BDI-Ia scale. Demographics and risk factors were assessed. A total of 15% of patients had undiagnosed depression. Multivariate analyses demonstrated an increase in BDI scores with increased age. An approximately 1-point increase in the BDI score was observed for each additional decade of age in hypertensive patients. Additional factors associated with increased risk of depression included being female (4.28-point BDI score increase), smoking (5.61-point BDI score increase), being hypertensive with no hypertensive medication (4.46-point BDI score increase) and being illiterate (4.46-point BDI score increase). This study demonstrated that demographic characteristics (age, sex, and education level), behavior (smoking,) and adherence to anti-hypertensive medication were associated with undiagnosed depression (26).

Most of the literature uses a cohort or case control study design to examine the association between depression and uncontrolled hypertension or adherence to antihypertension medication. This study is a cross-sectional survey chosen because it can provide outcomes in an easy, fast, inexpensive way.

Methodology

Study setting, aims and sampling procedure

This study was a cross-sectional survey conducted on chronic disease clinic patients attending all 13 PHC clinics of the Ministry of Health's in AL Khobar city, in the Kingdom of Saudi Arabia during the period from March 01, 2017 to April 01, 2017.

There is a total of 13 PHC center in the AL Khobar area. In each PHC center there is a nurse in triage area who measures vital signs and carries out other screening to distribute patients to required services. There is a chronic disease clinic, mental health clinic and some PHC centers offer psychotherapy and social services.

As part of this study I visited the physicians who provide the service in the chronic disease clinic of all 13 PHC clinics. I explained the rationale of the study and the questionnaires to the teams. I trained those nurses who were willing to participate in how to complete the questionnaires.

To fulfil the selection criteria patients had to be adults aged 18 years and above with a previous diagnosis of depression and previously diagnosed hypertension

Patients with co-morbid diabetes mellitus were excluded from the study.

Sample size was calculated using the electronic calculator on site Checkmarket (27) with the population size of 240, margin of error 2% and a confidence interval of 95% so our required sample size was 240. All patients who agreed to take part in the study were screened for symptoms of depression using a PHQ9 questionairre.

The manager of each of the 13 Primary Health Centres (PHC) were asked to recruit volunteers to participate in this study and two hundred and forty questionnaires were distributed in total. 24 questionnaires were sent to the PHC which had the largest number of visitors per month. The other 12 PHC received 18 questionnaires each.

200questionnaires out of the 240 questionnaires were returned, with a drop-out rate of 16%. 185 questionnaires were included in the study because participants had completed all four sections of the questionnaire. 15 questionnaires were rejected because they had more than 50% incomplete data.

Of the 185 people who returned fully completed questionnaires 58 (31%) participants fulfilled the criteria for a co-morbid diagnosis of depression with hypertension.

One hundred and twenty-seven (69%) were diagnosed as depression without hypertension.

The study variables

Dependent variable: Hypertension level, satisfaction, lifestyle,

Independent variables: Depression

Data collection tools

A questionnaire was designed to collect socio-demographic information, information about the chronic disease, life style and health-related behavior and smoking habits and medication adherence .

The Patient Health Questionnaire-9 (PHQ-9) (28) was used as screening tools to screen hypertensive patients for depression in the chronic disease clinic, and for assessment of severity of both previously and newly diagnosed depression.

Patients were considered hypertensive if they had previously been diagnosed according to (NICE) guidelines criteria and anybody with a reading of BP > 140/90 was registered as a hypertensive patient in the selected clinics at the 13 health centers in keeping withthe WHO Clinical Criteria for Metabolic Syndrome (MS) (29).

Data collection

The Data was collected using a two stage process:

First stage: Data were collected from patients through self-administered questionnaire about socio-demographic information, information about the chronic disease, life style and health-related behavior and smoking habits, medication adherence and Patient Health Questionnaire-9 (PHQ-9). A trained team researcher interviewed patients who were unable to complete the questionnaires unaided.

Second stage: A trained team researcher were used in all the 13 ceneters, the team were given one training session by the researcher in how to expline and assisst the participants how to fill the questionnaires which includes personal data, family history of mental diseases and hypertention, personal history of hypertension, admssion due to hypertention or depression and perceived data by asking participants whether they think that their hypertension was controlled or not, review the medical recored (files) for all participants who completed the self-administered questionnaire and document the required data in the questionnaire about respondeners (weight, height, BP, BMI), lab tests profile, complications, and medication and the team researcher measure the blood pressure for all the participants during data collection and document it, we considered blood pressure of 140\90 or below is controlled.

Statistical analysis

Questionnaires with more than 50% lost data were discarded from the study and 185 questionnaires were eligible for final analysis. The Statistical Package for Social Sciences (SPSS version 20) was used for data entry and analysis. All collected data were checked, coded, and then entered into a personal computer. Data were analyzed using frequencies and cross-tabulations. The analyses of continuous variables was presented using descriptive statistics, such as percentage, means, and standard deviations.

The association between the personal history, life style, correlation between PHQ9 items and the independent variables, correlation between loss of appetite and feel tired and drugs were measured using the chi-square. Multiple logistic regressions were performed to evaluate the combined effect of the various factors associated with depression. Univariate analysis to test the associated factors will be performed. P-value of less than 0.05 will be considered significant.

Ethical consideration

The approval and permission from the Ministry of Health Research Committee were obtained before conducting the study.

All participants had the right to refuse participation in this study at any time, know the purpose of the study, respect their privacy, keep total confidentiality, and be reassured that it will not have any negative effect on them or their physicians.

Informed consents were obtained from each participant. The introduction to the questionnaire explained the purpose of the study and that all collected data from the attendees would be used for research purposes only and handled with confidentiality. This research was self-funded.

Results

A total of 240 questionnaires were distributed in PC Health Center in Al-Khobar area, 200 received and 185 were enrolled in the study due to missing or incomplete data. Of the 185 participants, 58 (31%) were diagnosed with depression with hypertension. The mean age ± SD was 49±10 for the Cases, 43 ± 12 for the control sample, and total 44.7 ± 11.6. The depressive patients with hypertension were older than who hasn't hypertention with significant value (p-value 0.011).

Table (1): Socio-demographic characteristics

	D+HTN (N=58)	D-HTN (N=127)	Total (N=185)	P-value
	N (%)	N (%)	N (%)	
Gender:				
Male	16(27.6)	42(33.1)	58(31.4)	0.456
Female	42(72.4)	85(66.9)	127(68.6)	
Marital status:				
Married	44(75.9)	96(75.6)	140(75.7)	0.968
Single, divorced, widow	14(24.1)	31(24.4)	45(24.3)	
Educational level:				
illiterate	14(24.1)	14(11)	28(15.1)	0.047*
primary	20(34.5)	36(28.3)	56(30.3)	
secondary	13(22.4)	37(29.1)	50(27.0)	
University and post graduate	11(19)	40(31.5)	51(27.6)	
Residency type				
Owner	36(62.1)	75(59.1)	111(60.0)	0.698
Rent	22(37.9)	52(40.9)	74(40.0)	
Occupation:				
No job	37(63.8)	65(51.2)	102(55.1)	0.069
Governmental	6(10.3)	34(26.8)	40(21.6)	
Non-governmental	5(8.6)	13(10.2)	18(9.7)	
Retired	10(17.2)	15(11.8)	25(13.5)	
Income:				
less than 3000 SR	12(20.7)	17(13.4)	29(15.7)	0.646
from 3000-6000	19(32.8)	38(29.9)	57(30.8)	
from 6000-10000	12(20.9)	31(24.4)	43(23.2)	
from 10000-15000	11(18.9)	27(21.2)	38(20.5)	
more 15000	4(6.9)	14(11.1)	18(9.7)	

Chi square test was performed
*Statistical significant at $p<0.05$

Among depressive participants with hypertension, 16 (27.6%) were men, and 44 (75.9%) were married. Almost 24.1% (n=14) of these participants were illiterate, 34.5% (n=20) had primary education, 22% (n=13) had secondary education, and 19% (n=11) had university degree and higher. Patients who only finished primary level of education or less were more prone to depression with hypertension with p-value 0.047 which is significant. The vast majority of depressive patients with hypertension were unemployed (n=37, 63.8%). More than half of depressive participants without

hypertension were women (n=85, 66.9%), married (n=96, 75.6%), and unemployed (n=65, 51.2%) (Table 1).

Table (2): Relationship between family history and depression in participants with and without hypertension.

	D+HTN (N=58)	D-HTN (N=127)	Odds Ratio	P-value
	N (%)	N (%)		
HPT family history:				
Yes	47(81.0)	89(70.1)	0.548	0.117
No	11(19.0)	38(29.9)		
Famil history of mental illnes				
Yes	17(29.3)	31(24.4)	1.284	0.480
No	41(70.7)	96(75.6)		

Chi square test was performed
*Statistical significant at $p<0.05$

Table 2 shows that 47 (81%) of the depressive participants with hypertension and 89 (70%) of depressive participants without hypertension had family history of hypertension. Moreover, 17 (29.3%) and 31 (24.4%) of the depressive participants with hypertension and depressive participants without hypertension had family history of mental illness, respectively.

Table (3): Relationship between personal history and depression in participants with and without hypertension.

	D+HTN (N=58)	D-HTN (N=127)	Odds Ratio	P-value
	N (%)	N (%)		
Personal history of mental illness:				
Yes	12(20.7)	35(27.6)	0.686	0.319
No	46(79.3)	92(72.4)		
Hospitalization for either hypertension or depression				
Yes	14(24.1)	19(15)	0.553	0.13
No	44(75.9)	108(85)		

Chi square test was performed
*Statistical significant at $p<0.05$

Table 3 shows that A total of 12 (20.7%) and 35 (27.6%) participants among those with depression with hypertension, and depression without hypertension had personal history of mental illness, respectively. Moreover, 14 (24.1%) and 19 (15.0%) of the depressive participants with hypertension and depressive participants without hypertension had personal history of hospital admission due to uncontrol hypertension or depression, respectively.

Table (4): Association between life style among depression with hypertension and without hypertension.

Life style	D+HTN (N=58)	D-HTN (N=127)	Odds Ratio	P-value
	N (%)	N (%)		
Diet control:				
Yes	46(79.3)	85(66.9)	1.894	0.086
No	12(20.7)	42(33.0)		
Physical activity:				
Yes	45(77.6)	85(66.9)	1.710	0.141
No	13(22.4)	42(33.0)		
Smoking:				
Yes	9(15.5)	32(25.2)	0.545	0.141
No	49(84.5)	95(74.8)		

Chi square test was performed
*Statistical significant at $p<0.05$

Regarding the lifestyle in depressive participants with hypertension, 46 (79.3%) had diet control, and 45 (77.5%) were physically active. Meanwhile, 85 (66.9%) participants among those with depression without hypertension had diet control and were physically active.

A significant majority of depressive participants with hypertension were nonsmokers (n=49; 84.4%). Meanwhile, among the participants with depression without hypertension, 32 (74.8%) were nonsmokers.

The Odds ratio of diet control among participants with depression with hypertension is 1.89 times higher than those with depression without hypertension (95% confidence interval (CI): 0.908–3.95), which is not significant.

No correlation was found between lifestyle and depression with hypertension and without hypertension as shown in Table 4.

Table (5): BMI and the lab result of the studied sample.

	D+HTN (N=58)	D-HTN (N=127)	Student t test	P-value
	Mean ± SD	Mean ± SD		
Weight	83.2 ± 17.9	78 ± 18.5	1.811	0.072
Height	159.7 ±7.9	159 ± 16.1	0.313	0.755
SBP	134.5 ± 15.8	119 ±14.9	6.479	0.000*
DBP	82.4 ± 11.2	72.3 ± 8.3	6.84	0.000*
Fasting blood glucose	94.2 ± 16.5	137.2 ± 63.9	5.04	0.000*
HBA1c	6.3 ± 1.1	7.8 ± 5.2	2.145	0.033*
Total cholesterol	192.1 ± 34.1	185.7 ± 37.1	1.117	0.265
TG	122.3 ± 52.6	149.3 ± 79.9	2.35	0.02*
LDL	116.3 ± 33.2	108.8 ± 33.4	1.434	0.153
HDL	48.8 ± 12.3	47.4 ± 13.2	0.691	0.490
BMI	33.7 ± 11.6	29.7 ± 6.6	2.917	0.004*

Student t test was performed

*Statistical significant at $p<0.05$

As regards BP and fasting blood sugar, the fasting blood sugar, BMI, SBP, and diastolic blood pressure of the hypertensive participants was 94.2 ± 16.5, 33.7 ± 11.6, 134.5 ± 15.8, and 82.4 ± 11.2, respectively which is highly significant. Meanwhile, the fasting blood sugar, BMI, SBP, and diastolic blood pressure in the depressive participants without hypertension was 137.2 ± 63.9, 29.7 ± 6.6, 119 ±14.9, and 72.3 ± 8, respectively which is highly significant.

The HBA1c in depressive participants with and without hypertension was 6.3 ± 1.1and 6.3 ± 1.1, respectively, which is significant.

The triglycerides level in depressive participants with and without hypertension was 122.3 ± 52.6 and 149.3 ± 79.9, respectively, which is significant (Table 5).

Table (6): Correlation between each PHQ9 item in depression with hypertension and without hypertension.

PHQ9 item	**D+HTN (N=58)**	**D-HTN (N=127)**	**Odds Ratio**	**P-value**
Loss of interest:				
Yes	24(41.4)	47(37.0)	1.202	0.571
No	34(58.6)	80(63.0)		
Feeling sad				
Yes	26(44.8)	67(52.8)	0.728	0.317
No	32(55.2)	60(47.2)		
Sleep disturbance:				
Yes	21(36.2)	64(50.4)	0.559	0.072
No	37(63.8)	63(49.6)		
Feel tired:				
Yes	26(44.8)	35(27.6)	2.136	0.020*
No	32(55.2)	92(72.4)		
Loss of appetite				
Yes	32(55.2)	49(38.6)	1.959	0.035*
No	26(44.8)	78(61.4)		
Feel self-unsatisfied				
Yes	31(53.4)	68(53.5)	1.8	0.990
No	27(46.6)	59(46.5)		
Loss of concentration				
Yes	24(41.4)	46(36.2)	1.243	0.502
No	34(58.6)	81(63.8)		
Slow movement and speech:				
Yes	39(67.2)	76(59.8)	1.377	0.336
No	19(32.8)	51(40.2)		
Prefer to die:				
Yes	49(84.5)	107(84.3)	1.018	0.968
No	9(15.5)	20(15.7)		

Chi square test was performed

*Statistical significant at $p<0.05$

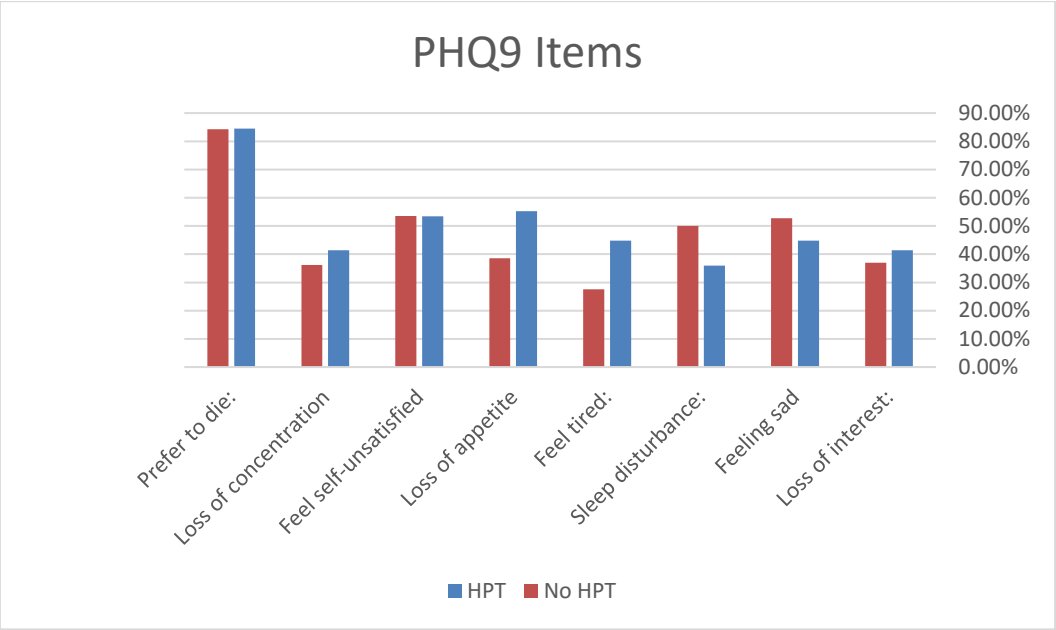

Figure 1: Correlation between PHQ9 items and depression with hypertension and without hypertension.

In terms of PHQ9 items, 26 (44.8%) and 35 (27.5%) participants in the depressive with and without hypertension group reported feeling tired, respectively.

In addition, 32 (55.1%) and 49 (38.5%) participants in the depression with and without hypertension group reported loss of appetite, respectively.

The Odds ratio of feeling tired among those with depression with hypertension is 2.136 times higher than in those with depression without hypertension (95% CI: 1.118–4.081), which is significant.

The Odds ratio of loss of appetite among those depression with hypertension is 1.959 times higher than those with depression without hypertension (95% CI: 1.045–3.674), which is significant (Table 6, Figure 1).

Table (7): The relationship between perceived poorly controlled hypertension and severity of depression.

	HTN control (N=23)	No HTN control (N=21)	P value
Depression	**N (%)**	**N (%)**	
mild	30 (51.7)	15 (25.9)	
Moderate to severe	7(12.1)	6 (10.3)	.665
Total	37(63.8)	11(36.2)	

Chi square test was performed
*Statistical significant at p<0.05

Table (8): The relationship between poorly controlled hypertension and severity of depression.

	HTN control B.P <140\90 (N=32)	No HTN control B.P >140\90 (N=26)	Total (N = 58)	P- value
Depression	N (%)	N (%)	N (%)	
mild	26 (44.8)	20 (34.6)	46(79.4)	
Moderate to severe	6(10.3)	6 (10.3)	12(20.6)	.692
Total	32(55.1)	26(44.9)		

Chi square test was performed
*Statistical significant at p<0.05

Table 7, 8 summarized the results of perceived (by asking participants whether they think that their hypertension was controlled or not) and measured blood pressure control of hypertension associated with the level of depression.

Among hypertensive patients in mild and moderate to severe level of depression, about 21(36%) were perceive or feel that their hypertension is uncontrolled, while in blood pressure measurement was 26(45%).

About 37(64%) of hypertensive patients perceived or felt that their hypertension was controlled in mild and moderate to severe level of depression, and 32 (55%) by blood pressure measurement. There was no significant association found.

Discussion

In this cross-sectional study, we analyzed the relationship between hypertension and depression in patients in the PHC setting. Among the 185 participants, 31% were diagnosed with hypertension. The mean age of all participants was 44.7 ± 11.6. Among the hypertensive participants, 27.6% and 75.9% were men and married, respectively. Moreover, 24% of the hypertensive participants were illiterate, 34.5% finished primary degree, 22% finished secondary degree, and 19% finished university degree and higher. The majority of hypertensive participants were unemployed (63.8%). Meanwhile, more than 50% of the non-hypertensive participants were women (66.9%), married (75.6%), and unemployed (51.2%).

First, we found that the rate of depression with hypertension was significantly higher in the elderly group than that in the young age group. However, this association could be due to comorbidities and social and lifestyle factors. Second, patients who finished only a primary level of education or less were more prone to depression with hypertension (Table 1). This result may be primarily due to poor patient knowledge of their disease, hidden agenda, noncompliance to treatment, and unhealthy lifestyle. In keeping with these results, a cross-sectional study in urban Nepal found that those with old age and illiterate have higher score of depression (26). Although in this study, age was significantly associated with depression and hypertension, the sex showed no significant association. By contrast, Shah et al. (15,24) reported that women and older adults with more depressive symptoms were at higher risk of elevated SBP than those with fewer depressive symptoms. Meanwhile, no differences in depression and hypertension according to sex were noted in the cohort study done in England on 2014 (5).

This study showed no significant association between income and depression (Table 1), which is similar to the result of a cross-sectional study in urban Nepal (26). By contrast, a community-based study from rural Nepal showed that the prevalence of depression was greater among low-caste groups (30). This can be explained by the free medical service provided to the citizens and government employees in Saudi Arabia, which can play a role in the equity of care given.

In the present study, almost 80% and 70% of hypertensive and non-hypertensive participants had family history of hypertension, respectively. Moreover, one-third and a quarter of the hypertensive and non-hypertensive participants had a family history of mental illness (Table 2), respectively. This rate was comparable to that in a recent study done in Khobar in Saudi Arabia that showed a low rate of family history of mental problems among patients with chronic disease. The authors attributed the results to social stigma (24). Meanwhile, the results in our study could be due to differences in the study setting.

Although some studies found a relationship between lifestyle and depression, no correlation between lifestyle and depression with hypertension and without hypertension was noted in our study as shown in (Table 4). This result is similar to that in a cohort study done in England in 2014 that showed that lifestyle behaviors had minimal impact on the symptoms of depression (5).

In our study, no significant association between sleep disturbance and depression was noted in hypertensive and non-hypertensive participants (Table 6). By contrast, a recent cross-sectional study done in Al-Khobar in Saudi Arabia showed a significant association between depression and sleep disturbance (24). Moreover, a survey of the civilian noninstitutionalized US population between 1971 and 1975 reported a significant association between depression, insomnia, and sleep duration and the outcome of hypertension incidence in middle-aged participants (10).

No correlation was noted between smoking and depression among hypertensive and non-hypertensive participants in the present study (Table 4). However, a cross-sectional study in urban Nepal found that smoking was a strong predictor of depression, and evidence suggests that nicotine dependence may lead to an increased risk of depression (26).

We found a significant association between both BP parameters (i.e., systolic and the diastolic blood pressure) and depression in both hypertensive and non-hypertensive participants (P=0.000) (Table 5). In the study conducted by Diminic-Lisica et al in Rijeka, Croatia, the experimental group had significantly higher values of both systolic and diastolic blood pressure compared to the control group, and this result is comparable to

ours (20). On the other hand, a recent cohort study done in England and a study done in Norway found that symptoms of depression were associated with decrease in BP (5, 23).

Fasting blood sugar, HGA1C, TG, and BMI were all significantly correlated with depression in hypertensive and non-hypertensive participant (P=0.000, 0.033, 0.02, and 0.004, respectively) (Table 5). A cross-sectional study done in Saudi Arabia found that obesity with high BMI was significantly associated with depression, as supported by the association between inactivity and low mood (22). Moreover, an insignificant association between depression with hypertension and diabetes was reported by a cross-sectional study in Saudi. They reported that HGA1C was not associated with depression, hypertension, and diabetes (24).

A lot of studies found a correlation of individual symptoms of depression with hypertension (31, 8). We correlate the total scoring of PHQ-9 (mild, moderately severe) with controlled/uncontrolled hypertension with depression each separately but because sample size is small for mild (26, 20), moderately severe (6, 6) for controlled/ uncontrolled respectively and it was insignificant (Table 7, 8).

Analysis of PHQ9 items in our study showed that feeling tired, sleep disturbance, and dysthymic mood were present among 44%, 36%, and 45% of participants, respectively (Table 6, Figure 1), which was comparable to the rate for the same items reported in the cohort study done by Ried at 41%, 26%, and 26% respectively (31). Also, 55.1% and 38.5% of participants in the hypertensive and non-hypertensive group reported loss of appetite.

We studied the correlation between perception of uncontrolled hypertension and the level of depression as well as the relation between objective measurement of BP and the level of depression (Table 7, 18). We did not find a significant correlation between depression and uncontrolled hypertension. By contrast, Alkhathami et al. found a significant association in patient perception of uncontrolled hypertension and depression (24). However, similar to our results, they found an insignificant association between objective measurement of BP and depression (24). By contrast, a recent case-control study from Pakistan showed a significant association between uncontrolled HTN and depression (4).

Limitations

During conduction of the research, the period over which the research was conducted was not long enough to increase the sample size. I did not find a relationship between uncontrolled hypertension and the level of severity of depression because of the limited number of patients, therefore, the chi-square cannot be calculated. A future study would require a larger sample to assess the relationship between uncontrolled hypertention and the level of depression.

The response rate was lower than expected possibly due the length of the questionnaire and as it is a self-administered questionnaire maybe the response was affected by subjectivity and rely on memory, and also, this could subjected to interviewer bias as the questionnaire is not filed by the primary researcher .

As in our practice may be there was a missed data in the health records, this make our reasearch subjected to reporting bais.

If the health records (files) were computerized that would help us to simplify the questionnaire. National wise, if there was a national database for chronic illness in Saudi Arabia that would help to increase the sample size and to conduct more specific research.

Conclusion

In Saudi Arabia, both hypertension and depression are considered a major health problem and comorbidity is not rare.

In our study we concluded that age and illitracy have significant relationship with depression and hypertension. Also greater role was found to be related to multiple factors associated with depression and hypertension DPB, SBP, TG, HGA1C, fasting blood sugar and BMI. The items on the PHQ-9 that measured feeling tired and loss of apetite were the most significantly correlate with depression and hypertension.

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EDUCATION:

- **Graduated from K.F.U / Dammam**
- **(MBBS of medicine & surgery) in 1995.**
- **Saudi Diploma in Family Medicine (SD-FM) in 2015.**
- **International course in primary care mental health from Nova university in Lisbon in 2014.**

EXPERIENCE:

- **Work in Primary Health Care Center for 8 years (from 1417 till 1425).**
- **Work in Primary Mental Health Care Clinic for 9 years (from 1425 till now)**
- **Work in rehabilitation clinic for handicap children for 1 year (from 1425 – 1426)**

TRAINING:

- **Training program for 3 months in psychiatric department (2003).**
- **Seven Modules in Family Medicine Essential (FAME) courses (2011).**
- **CBT courses about (depression, Anxiety, personality disorder)**
- **FAMILY MEDICINE ESSENTIALS (FAME) MODULAR COURSE**
- **Evidence base medicine course.**

Appendix:

مديرية الشؤون الصحية بالمنطقة الشرقية

معلومات تقرأ للمستجيب:

نقوم بالبحث للتعرف على معدل الإنتشار وتأثير الاضطرابات النفسية على معالجة مرضي السكري وارتفاع ضغط الدم بعيادات الخبر والدمام وذلك لأجل توفير معلومات تساهم في تحسين وتطوير برنامج الامراض المزمنة وتساعد على تقديم خدمة متميزة للمرضى.
نطلب منكم الموافقة على الإنضمام لهذا البحث والذي يتضمن الإجابة على أسئلة هذا الاستبيان والاطلاع على ملفكم للتعرف على نوع وجرعة العلاجات والتحاليل المعملية.
إجابتك سوف تكون سرية ولن يتطلع عليها أحد ولن يتم كتابة اسمك بالاستبيان ولن يتم الاحتفاظ بالاستبيان بعد تحليل المعلومات ومشاركتك في الاستبيان اختيارية ولك مطلق الحرية في التوقف عن الإجابة على الاستبيان في أي وقت تحب.

شكرا على المشاركة والمساعدة

التاريخ / / م اسم المركز الصحي ..... رقم الاستمارة

رقم الملف: ..... الهاتف الجوال (اختياري):

..... الجزء الأول: معلومات عامة عن

المريض والمرض

ضع علامة (√) على الاجابة المختارة

أسئلة شخصية عامة	
١.	**العمر:** .....
٢.	**الجنس:** ١) ذكر ☐ ٢) أنثى ☐
٣.	**الحالة الاجتماعية:** ١. متزوج ☐ ٢. عازب ☐ ٣. مطلق ☐ ٤. أرمل ☐
٤.	**المستوى التعليمي:** ١. أمي ☐ ٢. محو امية ☐ ٣. ابتدائي/متوسط ☐ ٤. ثانوي ☐ ٥.جامعي ☐ ٦. دراسة عليا ☐
٥.	**نوع السكن:** ١. سكن ملك ☐ ٢. مستأجر ☐
٦.	**العمل الحالي:** ١. عاطل ☐ ٢. ربة منزل ☐ ٣. طالب ☐ ٤. موظف حكومي ☐ ٥) عمل حر ☐ ٦. موظف قطاع خاص ☐ ٧. صاحب عمل ☐ ٨. متقاعد (معاشي) ☐
٧.	**عدد أفراد الأسرة:** ( )
٨.	**الدخل الشهري للأسرة (بالريال السعودي)** ١) أقل من ٣٠٠٠ ☐ ٢) ٣٠٠٠ _ ٦٠٠٠ ☐ ٣) ٦٠٠٠ ـ ١٠٠٠٠ ☐ ٤) ١٠٠٠٠ ـ ١٥٠٠٠ ☐ ٥) أكثر من ١٥٠٠٠☐
معلومات عن الأمراض المزمنة	
٩.	**هل أنت مصاب بمرض ضغط الدم؟** ١. نعم ☐ ٢. لا ☐
١٠.	**إذا كانت الاجابة نعم منذ كم سنة** ☐
١١.	**هل تعتقد انه تم التحكم بمرض ضغط الدم؟** ١. نعم ☐ ٢. لا ☐
١٢.	**حدد مدي التزامك بأخذ ادوية ضغط الدم** ١. غير ملتزم ☐ ٢. بعض الأحيان ☐ ٣. أغلب الأحيان ☐ ٤. ملتزم جداً ☐
أسلوب الحياة	
١٣.	**حدد مدي التزامك بالحمية الغذائية (٤ ملتزم جداً ـ ١ غير ملتزم)** ١. غير ملتزم ☐ ٢. بعض الأحيان ☐ ٣. أغلب الأحيان ☐ ٤. ملتزم جداً ☐
١٤.	**النشاط البدني:** ١. منتظم (٣٠ دقيقة مشي في اليوم أو أكثر) ☐ ٢. غير منتظم ☐ ٣. لا أمارس ☐
١٥.	**هل تم تشخيصك من قبل بالإصابة بالاضطرابات نفسية؟** ١. لا ☐ ٢. كآبة ☐ ٣. قلق ☐ ٤. فصام ☐ ٥. أخرى حدد .....
١٦.	**إذا كنت تعاني من اضطرابات نفسية هل تتلقى أي نوع من العلاج لهذه الاضطرابات بمكان آخر غير هذا المركز ؟** ١. نعم ☐ ٢. لا ☐

١٧.	**هل تنومت في المستشفى او العناية المركزة ولماذا؟** ١. نعم ☐ ٢. لا ☐ السبب _____
	التاريخ العائلي
١٨.	**هل أحد أفراد عائلتك مصاب بمرض السكري؟** ١. نعم ☐ ٢. لا ☐ ٣. غير متأكد ☐
١٩.	**هل أحد أفراد عائلتك مصاب بمرض ارتفاع الضغط؟** ١. نعم ☐ ٢. لا ☐ ٣. غير متأكد ☐
٢٠.	**هل أحد أفراد عائلتك مصاب بمرض نفسي؟** ١. نعم ☐ ٢. لا ☐ ٣. غير متأكد ☐
٢١.	**التدخين:** ١. لا أدخن ☐ ٢.أدخن السجائر ☐ ٣. غليون ☐ ٤. شيشه ☐ ٥. مدخن سابقاً ☐
٢٢.	**إذا كنت تدخن السجاير كم سيجارة يومياً؟** ١. اقل من١٠ ☐ ٢. من١٠ – ٢٠ ☐ ٣. اكثر من ٢٠ ☐
٢٣.	**استخدم الكحول والمواد المخدرة:** ١. نعم ☐ ٢. لا ☐ ٣. سابقاً ☐

الجزء الثاني: استبيان عن صحة المرضى (PHQ-9)

خلال الأسبوعين الماضيين، كم مرة عانيت من أي من المشاكل التالية؟

الرقم	الموضوع	ولا مرة	عدة أيام	أكثر من نصف الأيام	كل يوم تقريباً
١	قلة الاهتمام أو قلة الاستمتاع بممارسة أو بالقيام بأي عمل	٠	١	٢	٣
٢	الشعور بالحزن أو ضيق الصدر أو اليأس	٠	١	٢	٣
٣	صعوبة في النوم أو نوم متقطع أو النوم أكثر من المعتاد	٠	١	٢	٣
٤	الشعور بالتعب أو بامتلاك القليل جداً من الطاقة	٠	١	٢	٣
٥	قلة الشهية أو الزيادة في تناول الطعام عن المعتاد	٠	١	٢	٣
٦	الشعور بعدم الرضا عن النفس أو الشعور بأنك قد أخذلت نفسك أو عائلتك	٠	١	٢	٣
٧	صعوبة في التركيز مثلاً أثناء قراءة الصحيفة أو مشاهدة التلفزيون	٠	١	٢	٣
٨	بطء في الحركة أو بطء في التحدث عما هو معتاد لدرجة ملحوظة من الآخرين / أو على العكس من ذلك التحدث بسرعة وكثرة الحركة أكثر من المعتاد	٠	١	٢	٣
٩	راودتك أفكار بأنه من الأفضل لو آنت ميتا أو أفكار بأن تقوم بإيذاء النفس	٠	١	٢	٣

معلومات ملف المريض:

التاريخ: / / م **رقم الملف:**..... **رقم الاستمارة:**

قم بتدوين المعلومات أدناه من ملف المريض :

١ -الوزن ٢-الطول ٣-قياس الضغط:

٤- تحليل السكر صايم (FBG) ٥ - (HB A1c)

٦-معدل الدهون Total cholesterol ٧-معدل الدهون الثلاثية TG

٨-معدل الدهون قليل الكثافة LDL ٩-معدل الدهون عالي الكثافة HLD

١٠- معدل كتلة الجسم BMI

١٢. هل يوجد مضاعفات للمرض؟ ١ -نعم ☐ ٢ -لا ☐

١٣- إذا كان الجواب بنعم حدد في أي من الأعضاء التالية توجد المضاعفات؟

١. الكلى ☐ ٢. العين ☐ ٣. المخ ☐ ٤. القلب ☐ ٥. القدم ☐

١٤ -هل لديه امراض مزمنة أخرى؟ ١-نعم ☐ ٢-لا ☐

١٥-إذا نعم عددها؟ .....

١٦ -علاج ارتفاع ضغط الدم:

1. Diuretics ☐ 2. Calcium channel ☐ 3. Beta blockers blocker ☐
4.ACE Inhibitors ☐ 5. ARBs ☐ 6. Aspirin ☐

١٨-علاجات الاضطرابات النفسية: 2.TCA ☐ 1.SSRI ☐

١٩ – علاجات أخرى تؤخذ بصورة مستمرة ١. نعم ☐ ٢. لا ☐

إذا كانت الإجابة نعم أذكرها: .....

شكراً لكم على تفضلكم بملء هذا الاستبيان

والله ولي التوفيق

Directorate of Health Affairs in the Eastern Region

Graduate Program of Family Medicine

Khobar Area

A questionnaire

The prevalence and impact of mental disorders on the treatment of diabetes and high blood pressure in chronic diseases clinics in Al-Khobar and Dammam -2017.

We are researching the prevalence and impact of mental disorders on the treatment of diabetes and hypertension in Khobar and Dammam clinics to provide information that contributes to the improvement and development of the chronic disease program and helps to provide excellent service to patients.

We ask you to agree to join this research, which includes answering the questions of this questionnaire and see your file to know the type and dosage of treatments and laboratory analysis.

Your answer will be confidential and will not be viewed by anyone. Your name will not be written in the questionnaire. The questionnaire will not be retained after the analysis of the information and participation in the questionnaire is optional and you are free to stop answering the questionnaire at any time you like.

Thanks for sharing and assistance

Directorate of Health Affairs in the Eastern Region

Date: / / Health center: Form number: ☐☐ ☐☐☐

File number:..... Mobile number (optional):.....

Part 1: personal data information about the patient and his/her disease: Mark (√) the selected answer:

General personal information
Age: .....
Gender: 1. Male ☐ 2.Female ☐
Marital status: Married☐ Single ☐ divorced ☐ Widow ☐
Educational level: ☐ Illiterate.1 2. Literacy ☐ 3. Primary/intermediate ☐ 4. Secondary ☐ 5. University ☐ 6. Postgraduate ☐
Accommodation type 1. Privet house ☐ 2. Rented flat ☐
current work: 1. Unemployed ☐ 2. House wife ☐ 3. Student ☐ 4. government employee ☐ 5. Free work ☐ 6. Private sector employee ☐ 7. Business man ☐ 8. Retired ☐
Number of family members: ( )
Household monthly income (SR) 1.less than 3000 ☐ 2.3000 – 6000 ☐ 3.6000 – 10000 ☐ 4.10000 – 15000 ☐ 5. More than 15000 ☐
Information about chronic diseases
Are you suffering from hypertension? 1.yes ☐ 2. No ☐
If yes, for how many years? ☐
Do you think that your hypertension have been controlled? 1.Yes ☐ 2. No ☐
Determine your commitment to taking Antihypertensive medication 1. Uncommitted ☐ 2. Sometimes ☐ 3. Mostly ☐ 4. Very committed ☐
lifestyle
Limit your commitment to diet (4 very committed -1 non-committal) 1. Uncommitted ☐ 2. Sometimes ☐ 3. Mostly ☐ 4. Very committed ☐
Physical activity 1. Regular (30 minutes walking a day or more) ☐ 2. Irregular ☐ 3. I do not practice ☐
Have you ever been diagnosed with psychiatric disorders? 1. No ☐ 2. Depression ☐ 3. Anxiety ☐ 4. Schizophrenia ☐ 5. Other specified.....
If you have mental disorders, do you receive any treatment for these disorders other than this center? 1. Yes ☐ 2. No ☐
Did you admit in hospital or intensive care and why? 1. Yes ☐ 2. No ☐ Why _____

Family history:			
Is a member of your family having hypertension?	1. Yes ☐	2. No ☐	3. Not sure ☐
Is a member of your family having psychiatric illness?	1. Yes ☐	2. No ☐	3. Not sure ☐
Smoking: 1. I do not smoke ☐	2. smoke cigarettes ☐	3. Pipe ☐	4. Shisha ☐ 5. Quit smoking ☐
If you smoking how many cigarettes per day?	1.Less than 10 ☐	2. from 10 -20 ☐	3. More than 20 ☐
Alcohol and drug abuse?	1. Yes ☐	2. No ☐	3. Previously ☐

Part 2: Patient Health Questionnaire (PHQ-9)

Over the past two weeks, how many times have you experienced any of the following problems?

Over the last 2 weeks, how often have you been bothered by any of the following problems?	Not at all	Several Days	More than half the days	Nearly Every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling asleep or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself- or that you are a failure or have let yourself or family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite-being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself in some way	0	1	2	3

Thank you for filling out this questionnaire

Directorate of Health Affairs in the Eastern Region

Graduate Program of Family Medicine

The prevalence and impact of mental disorders on the management of diabetes and hypertension in chronic diseases clinics

Date: / / Health center: Form number: ☐☐ ☐☐☐

Write down the information below from the patient's file:

1.Weight ☐ 2. Hight ☐ 3.B.P. ☐

4.Fasting blood sugar (FBG) ☐ 5. (HB A1c) ☐

6. Total cholesterol ☐ 7. TG ☐

8. LDL ☐ 9. HLD ☐

10.BMI ☐

12.DO you have any complication from the chronic disease? 1.Yes ☐ 2.No ☐

13.If yes, specify in which of the following members are the complications?

1.Kidney ☐ 2.Eye ☐ 3.Brain ☐ 4.Heart ☐ 5.Foot ☐

14. Do you have other chronic diseases? 1.Yes ☐ 2.No ☐

15. If yes, state it? .....

16. Antihypertensive drugs:

1.Diuretics ☐ 2. Calcium channel blocker ☐ 3. Beta blockers ☐

4.ACE Inhibitors ☐ 5.ARBs ☐ 6.Aspirin ☐

18. Antidepressant drugs

1. SSRI ☐ 2.TCA ☐

19. Other medication are taken regularly? 1.Yes ☐ 2.No ☐

If yes, please mention: .....

Thank you for filling out this questionnaire