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Research Article

A Study of Hypertension and Associated Health Related Life Style Behaviours in Patients with Depression

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Abstract

Background: Patients with severe mental illness including depression may have multiple co-morbid physical illnesses. Systemic hypertension and lifestyle factors may increase mortality in patients with depression.

Objective: To study co-morbid hypertension and associated lifestyle factors in patients with major depression.

Methods: Cross section observational study at a tertiary care hospital.

Results: Patients evaluated after exclusion were 400. Majority of patients 69(34.5%) had moderate depression. The mean duration of illness was 58.94 ± 77.26 months with no significant difference between males and females (P = 0.830). Co-morbid psychiatric illness was present in 73(36.5%) study subjects. Co-morbid conditions were present in 106 (26.5%) patients. The prevalence of hypertension in our cohort was 18.5%. A total of 216 patients (54%) were found to be obese; it was significantly higher (Chi-square test, P = 0.024) in females (63.7%) as compared to males (47.5%). Inadequate physical activity was seen in 44.5% patients. On correlation analysis, a significant correlation (P<0.05) was observed between hypertension with obesity and family history of non-communicable disease. On binary logistic regression, in patients with depression, those with positive family history of non-communicable disease (OR = 2.6), increased duration of illness (OR = 1.3) and physical inactivity (OR = 2.1) were more likely to have hypertension.

Conclusion: A bidirectional association may exist between depression and hypertension with increased risk of cardiovascular morbidity.

Keywords: Major Depression; Hypertension; Global Physical Activity Questionnaire; Body Mass Index

Introduction

Over the last few decades, the prevalence of non-communicable diseases has increased globally [1]. Similarly, the prevalence of depression is also increasing along with other NCDs. A recent report from WHO, revealed that a large number of global deaths occur due to NCDs. The leading cause of death was identified as cardiovascular disease (44%), followed by cancers (22%), and respiratory diseases (9%) [3]. In India NCDs contribute to around 60% of all deaths [2]. Various risk factors which contribute to these NCDs include the lifestyle, behaviour, environmental exposures, hereditary, physical trauma, and other health conditions [4]. Behavioural factors may include consumption of tobacco, alcohol, an unhealthy diet or a sedentary lifestyle. The biological risk factors may include being overweight or obese, hypertensive, having deranged blood glucose and lipid profiles.

Based upon this knowledge screening, early detection & prevention or an intervention can be implemented. This has been done with an aim to reduce the prevalence of NCDs and their resultant effects on the quality of life. Co-morbidity is also increasing rapidly in younger age group where the negative consequences of co morbid conditions are more troublesome and bothersome compared to higher age group [5]. Epidemiologists believe that proportion of individuals with co morbid conditions will drastically increase

in near future due to increased life expectancy, unhealthy life style epidemic and environmental pollution.

It has been observed that patients with depression are dying at a younger age as compared to that few decades back [6]. This increase is mainly attributed to cardiovascular and cerebrovascular factors. Systemic hypertension is one of the measurable, detectable immediate proximate risk factors, in addition to diabetes and dyslipidaemia. Health related lifestyle factors and anthropometry are distant risk factors which work in tandem.

With better understanding of epidemiology of non-communicable diseases, distant risk factors were studied at larger level and importance in primordial/primary prevention became established in high risk population/groups.

Depression, which is much more prevalent than other SMI has greater public health significance.

Aim of the Study

The aim of the present study was to evaluate systemic hypertension with associated health related life style factors like substance use along with level of physical activity and anthropometric factors in stable patients with depression in clinical population in outpatient setting.

Materials and Methods

Study design: It was a cross sectional study in which purposive/convenient sampling was done for recruitment of participants. Assessment was done only once by the researcher. A written informed consent was obtained as per the tenets of the declaration of Helsinki.

Study population: Stable patients suffering from depression attending OPD services of department of Psychiatry were evaluated from December 2018 to March 2020.

Study sample: 400 clinically stable patients of depression.

Inclusion criteria

Patients of either gender with clinical diagnosis of major depressive disorder (MDD) after detailed workup, as per ICD-10 criteria between the ages of 18 - 69 years. Patients with first episode and recurrent depressive disorder with HRDS score < 24 at time of assessment.

Exclusion criteria

Patients with other co-morbid SMI (Schizophrenia, OCD, Dementia), with bipolar disorder, HDRS score >24, patients undergoing electroconvulsive therapy, patients having an organic brain syndrome or intellectual disability, and patients who are in acute intoxication or withdrawal phase of any substance were excluded from the study.

Instruments

Socio-demographic information will be obtained from all participants. Medical information will also be obtained from patient medical records.

Hamilton depression rating scale (HDRS or HAM-D)

The clinician administers a depression assessment scale. It comprises of seventeen items related to the symptoms of depression experienced by the patient, over the period of past one week. A score of 0 - 7 is considered to be within normal range and a Score of >20 or indicates depression of moderate severity [2,3].

A detailed behavioural questionnaire shall include details about alcohol consumption, smoking, salt intake, and fruit and vegetable consumption.

The assessment of biophysical parameters was done as per the guidelines of 'Cardiovascular survey methods of WHO, Third edition'. Blood pressure (BP) measurement was done by an automated sphygmomanometer. Anthropometric parameters: height, weight, waist circumference and body mass index (BMI) were assessed thereafter.

This was followed by administration of the Global Physical Activity Questionnaire (GPAQ) version 2 (Annexure 5) as per the protocol of GPAQ mentioned in the document developed by WHO. Information from patient's caregiver was included while administering this questionnaire wherever required/feasible. The score was entered as per the analysis guidelines of GPAQ questionnaire.

Blood pressure was measured twice at 5 minutes' interval with the patient seated in a chair, the back supported, the arm bare, at heart level; two readings were taken and averaged. An appropriate cuff was used to measure BP in overweight adults to avoid spuriously high BP by the standard sized cuff. Tobacco and caffeine were avoided at least for 30 minutes before the reading. In the present study hypertension was defined as BP of 140/90 or higher as per JNC 7 guidelines.

Biochemical measurements will include collection of blood and urine samples. Patient will be asked to arrive after an overnight fasting (12hrs). Blood sample will be collected using Wet Chemistry technique, taking all the universal precautions. For fasting blood glucose, sample will be sent in an EDTA (ethylene diamine tetra acetic acid) vial and for the Lipid Profile, a Plain vial will be used. These vials were labeled and then sent to the central labo-

ratory. Along with the blood sample, a spot urine sample was collected in a specican. The specican was labeled and then sent to the central laboratory.

Statistics

Statistical analysis was performed using IBM, SPSS Statistics version 26 (IBM Inc.). Categorical socio-demographic and clinical variables were described in terms of frequency and percentage. Continuous variables were expressed as mean ± standard deviation (SD). Categorical variables were compared using Chi-square test or its variations Fishers Exact test, whichever was applicable. The independent t test was used for continuous variables, with normally distributed data. If the assumption of normality was violated (Shapiro-Wilk test, $P < 0.05$), then non-parametric tests were used. The correlation between socio-demographic, clinical, anthropometric parameters and health related lifestyle variables and presence/ absence of hypertension (categorical variable) was done with Point Biserial correlation for continuous variables and Pearson Chi-square for categorical variables. Scoring of GPAQ was done on Likert scale, was converted to weighted domain score for comparison. Also, an overall score was generated as a continuous variable. A p-value less than 0.05 was considered statistically significant.

Results

The total number of patients in our cohort were 400. There were 180(40%) males with a male female ratio of 2:3. The mean age of the study sample was 39.76 ± 13.66 years; the mean age of males was 40.91 ± 14.98 years and females' years, respectively. The median age of males did not significantly differ from females (paired t-test, $P = 0.370$). Table 1 shows the socio-demographic profile of study subjects.

The primary psychiatric illness is described in table 2.

Variable	Whole sample (N = 400) Mean ± S.D; Frequency and percentages	Females (N = 240) Mean ± S.D; Frequency and percentages	Males (N = 160) Mean ± S.D; Frequency and percentages	P value
Age (in years)	39.7 ± 13.66	38.9 ± 12.7	40.9 ± 14.9	0.370
Marital Status				
Single	100 (25%)	40 (16.6%)	60 (37.5%)	
Married	268 (67.0%)	180 (75%)	88 (55%)	0.020
Divorced	32 (8%)	20 (8.4%)	12 (7.5%)	
Education				
Illiterate	80 (20%)	40 (16.6%)	40 (25%)	
Intermediate	20 (5%)	10 (4.2%)	10 (6.3%)	
Graduate/Post-graduate	200 (50%)	130 (54.2%)	70 (43.7%)	0.002
Professional/Honours	100 (25%)	60 (25%)	40 (25%)	
Religion				
Hindu	300 (84%)	160 (66.6%)	140 (87.5%)	0.420
Others	100 (16%)	80 (33.4%)	20 (12.5%)	
Occupation				
Unemployed	240 (60%)	160 (66.6%)	80 (50%)	
Clerical/shop/farmer	60 (15%)	40(16.6%)	20 (12.5%)	0.001
Semi-professional	50 (12.5%)	20 (8.3%)	30 (18.7%)	
Professional	50 (12.5%)	20 (8.3%)	30 (18.7%)	
Locality				
Urban	219 (54.7%)	119 (49.6%)	100 (62.5%)	0 .480
Rural	181 (45.3%)	121 (50.4%)	60 (37.5%)	
Family type				
Nuclear	200 (50.00%)	112 (46.67%)	88 (55.00%)	0.250
Others	200 (50.00%)	128 (53.33%)	72 (45.00%)	

Table 1: Socio-demographic profile.

Variable	Whole sample (N = 400)	Females (N = 240)	Males (N = 160)	P value
Primary Psychiatric Diagnosis				
Mild Depression (F32)	36 (9.00%)	16 (6.67%)	20(12.50%)	
Moderate Depression (F 32.1)	138 (34.50%)	80 (33.33%)	58 (36.25%)	
Severe Depression without Psychosis (F32.2)				
RDD Mild (F33.0)	80 (20.00%)	44 (18.33%)	36 (22.50%)	
RDD Moderate (F33.1)	12 (3.00%)	8 (3.33%)	4 (2.50%)	
RDD severe (F33.2)	88 (22.00%)	62 (25.83%)	26 (16.25%)	
RDD Remission (F33.4)	30 (7.50%)	14 (5.83%)	16 (10.00%)	
	16 (4.00%)	16 (6.67%)	0 (0.00%)	
Age of onset of illness (in years)	34.73 ± 13.09	34.43 ± 12.67	35.17 ± 13.77	0.750
Duration of illness (in months)	58.94 ± 77.26	59.68 ± 76.91	57.83 ± 78.26	0.830
Comorbidity Physical	65 (32.50%)	39 (32.50%)	26 (32.50%)	1.00
Comorbidity-Psychiatric	73 (36.50%)	47 (39.17%)	26 (32.50%)	0.340

Table 2: Primary psychiatric illness.

HDRS Score	Whole sample (N = 400)	Females (N = 240)	Males (N = 160)	P value
0 - 7	112	62	50	
8 - 13	176	114	62	
14 - 17	84	46	38	
18 -24	28	18	10	
Mean HDRS	10.57 ± 4.70	10.64 ± 4.48	10.46 ± 5.05	p = .80

Table 3: Hamilton depression rating scale score.

Onset of depression was slightly earlier in females at 32.5 (19.7) years as compared to males at 33.5 (22.75) years, respectively. Majority of patients 69 (34.5%) had moderate depression. Moderate depression was more common 24 (12%) in 15 - 29 years age group. The mean duration of illness is 58.94 ± 77.26 months with no significant difference between males and females (P = 0.830). Co-morbid psychiatric illness was present in 73(36.5%) study subjects. Twenty-four (12%) patients required hospitalization during the course of illness.

At the time of assessment, the mean HDRS score of patients was 10.6 ± 4.7. The difference in HDRS score between males and females was not statistically significant (independent t-test, P = 0.80).

Co-morbid conditions were present in 106 (26.5%) patients. Out of these 74 (18.5%) were hypertensives, 20 (5%) were diabetics, and 12 (3%) had coronary artery disease. Family history of non-communicable disease was present in 180 (45%) patients. Non-adherence to treatment for medical co-morbidities was observed in 24 (6%) patients. Forty-four (22%) were smokers and 50(12.5%) were alcoholics, currently. Table 4 shows the mean systolic, mean diastolic and mean of mean arterial blood pressure.

Table 5 shows the mean systolic, mean diastolic and mean of mean arterial blood pressure of different age groups.

The prevalence of hypertension

The prevalence of hypertension in our cohort was 18.5%. There was no gender difference in prevalence (Chi-square test, P = 0.345). The mean BMI of the sample was 27.7 kg/m^2. The mean BMI in males was 27.9 and in females was 29.4, respectively (Chi square test, P = 0.08). The cut off BMI for diagnosis of obesity as per WHO (Asians) was taken as ≥ 25.00 Kg/mt^2 for both males and females. A total of 216 patients (54%) were found to be obese; it was significantly higher (Chi-square test, P = 0.024) in females (63.7%) as compared to males (47.5%).

	Whole Sample Mean ± S.D.	Males Mean ± S.D	Females Mean ± S.D	(p value)
BP (Systolic)	117.45 ± 14.40	118.99 ± 14.39	115.30 ± 14.51	(P = 0.03)
BP (Diastolic)	77.86 ± 9.56	78.95 ± 8.97	76.23 ± 10.24	(P = 0.02)
Mean Arterial BP	91.08 ± 10.30	92.30 ± 09.90	89.25 ± 10.68	(P = 0.013)

Table 4: Mean blood pressure recordings.

	Up to 45 years (N = 246)	46-60 years (N = 84)	Greater than 60 years (N = 70)	P value
Mean Systolic BP (mm Hg)	116.91 ± 14.29	118.56 ± 15.75	123.14 ± 09.94	P = 0.282
Mean Diastolic BP (mm Hg)	77.75 ± 09.02	77.89 ± 10.93	80.00 ± 12.06	P = 0.612
Mean Arterial BP (mm Hg)	90.80 ± 10.04	91.45 ± 11.19	91.08 ± 10.30	P = 0.635

Table 5: Blood pressure measurements across different age groups.

Physical activity score was calculated by GPAQ questionnaire. METs (Metabolic Equivalents) are commonly used to express the intensity of physical activities and data analysis. The median level of physical activity was more in females (1929) as compared to males (900). The difference however, was not statistically significant. Inadequate physical activity was seen in 44.5% patients; out of these, 46.66% were males and 41.25% were females. The difference was not statistically significant. The overall hypertension is obese patients was 29.60% and 9.80% in non-obese subjects (Chi-square tests, P = 0.005).

The prevalence of hypertension was more in those with inadequate (21.34%) physical activity in comparison to those with adequate (19.81%) physical activity but this difference was not statistically significant (Chi-square tests, P = 0.345). The prevalence of hypertension was slightly higher in tobacco smokers (22.95%) versus non-smokers (19.42%) but the difference was not statistically significant (Chi-square tests, P = 0.567).

On correlation analysis between of hypertension with variables like age, gender, smoking, type of anti-psychotics, obesity, adequate physical activity, a significant correlation was observed with obesity and family history of non-communicable disease.

A binary logistic regression was done to ascertain the effect of age, gender, duration of illness, age of onset, score of physical activity, BMI, obesity, smoking and inadequate physical activity on the likelihood that patient with depression will have hypertension. Logistic regression model was statistically significant, Chi square (16) = 43.114; P = 0.001. The model explained 54.4% (Nagelkerke R^2) value of the variance of hypertension and correctly classified 86.5% cases.

Patients with positive family history of non-communicable disease are 2.6 times more likely to have hypertension than those who don't have family history of NCD. Those with increased duration of illness have 1.3 times more chances of hypertension and those with increased physical inactivity had 2.1 times more cardiovascular risk than physically active.

Discussion and Conclusion

This cross-sectional study was conducted in a tertiary care centre general hospital psychiatry unit in north part of the subcontinent in out-patients of depression attending follow up clinics. This study aimed to assess the prevalence of hypertension and its risk/associated factors in accordance with the standardised WHO approach for non-communicable disease assessment.

The results revealed that the prevalence of hypertension in our cohort with depression was 18.5%. The prevalence of hypertension in general population world-wide ranges from 7.3% to 66.3% [7,8]. The prevalence of hypertension in India is about 29.8 percent. The prevalence is generally lower in rural population, although we did not observe this trend in the cohort as all patients were having depression which is more common in urban population. [9] Studies have found that the prevalence is higher in states of Haryana and Punjab compared to South Indian population (31.8% versus

40%) [10]. Adamis and Ball studied the comorbidities in 75 elderly psychiatric patients and found that depressed patients had more cardiovascular diseases and hypertension than other psychiatric patients. A similar observation was also made by Nakagawara., *et al*. in patients with depression having melancholic features [11,12].

In a study of 2992 normotensive subjects between 25 - 64 years of age to evaluate the prospective association between depressive symptoms and development of hypertension, high scores of depressive symptoms doubled the risk for hypertension after a follow up of 6 to 7 years [13].

In another study on 3310 subjects, symptoms of depression and anxiety, measured by the General Well-Being Schedule were also associated with elevated risk of incident hypertension. This effect was more pronounced in men compared to women (RR = 1.56; 95% CI = 1.08 - 2.25) [14].

Studies have found that abnormal circadian BP regulation has been associated with depression. Depressive symptoms were associated with a higher diurnal variation in systolic BP (n = 26) in men without previous psychiatric diseases or any medication [17]. Although we did not observe diurnal variation in the present study, gender disparity was prominent in our study. This could be partially explained due to biological sex difference and behavioural risk factors like smoking, alcohol consumption, or physical activity. Autonomic nervous system dysfunction and abnormal hormonal regulation was hypothesized as probable explanation for this observation [15].

The prevalence of general obesity was 54% and abdominal obesity was 64% in our study population. Both these indices were significantly higher for females. Asian Indians have a greater predisposition to abdominal obesity and accumulation of visceral fat and this has been termed as "Asian Indian phenotype". In sub group analysis, obesity was influenced by locality (urban > rural) with greater propensity in urban population and duration of depression [16].

Studies have reported that physical inactivity may be a mediator of the relationship between depression and cardiovascular events or mortality. In a group of medically stable patients with coronary artery disease, Brummett., *et al.* found that depressive symptoms were associated with increased mortality and with physical inactivity [17].

In this study high depression scores and low physical activity were found to be strongly associated with each other. Individuals with inadequate physical activity group were > 2 times as likely to have a high systemic blood pressure than those in active group. The relationship between depression and physical inactivity is complex one. Regular physical activity decreases the risk of depression whereas cessation of exercise can lead to the development of depressive symptoms [18]. A bi-directional relationship exists between physical inactivity and depression. In a recent systematic review, baseline depression was found to be associated with the development of a sedentary lifestyle or to a lower level of physical activity [19].

The shortcomings of the present study were that selection of patients was not random, potentially leading to selection bias. The study design although prospective and interventional had a short follow up of patients, making associations difficult to interpret. Another limitation was a relatively short time duration (16 months) which preclude evaluation of mental illness with small case numbers and longer study duration may potentially introduce additional variance that might affect results.

In conclusion, the relationship between depression and BP is a complex issue. Published reports describe higher BP levels, higher hypertension, and circadian variation abnormalities in depressed patients. Several causative factors have been suggested, like autonomic nervous system dysfunction, and genetic influences. The clinical relevance of topic is clear, since depressive symptomatology is associated with poor BP control in hypertensive patients and with the development of complications of hypertension.

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