Research Article

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Mental health risk factors influencing metabolic syndrome among secondary school teachers of Mysore city, India

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ABSTRACT

Background: Metabolic syndrome has been suggested to be an intermediate pathway between depression and CVD wherein, chronic stress due to prolonged exposure to work stress, repeated stress over a period of time damages the HPA axis resulting in a maladaptive process as well as inflammatory factors like CRP which causes depression and poor health habits, leading to development of metabolic syndrome. The risk factors causing stress among the school teachers is very high as compared to other professional groups which not only affects their health but also adversely affects the students and their learning environment. The interventions have been mainly to reduce the level of work related stress and improve their performance in teaching, but have neglected a holistic approach to improve their overall health conditions.

Methods: Cross sectional study was done in Mysore city among 320 Secondary school teachers aged 20 years and above, with at least one year of teaching experience. A self-administered, pretested and structured questionnaire based on the WHO steps approach for NCD, Gurmeet Singh's Presumptive Stressful Life Events Scale (PSLES) for stress, PHQ 9 for depression and GHQ28 for general mental health status.

Results: The prevalence of metabolic syndrome was 115 (38.3%). 30.6% had mild to moderate depression and only 2.3% had severe depression. 141 (47.0%) had moderate stress and only 42 (14%) had severe stress. The prevalence of minor psychiatric disorders (MPD) was 66 (22%). The mental health status did not have any statistically significant effect on the occurrence of MS or its risk factors.

Conclusions: The poor mental health status was significantly associated with high fasting blood glucose levels, moderate to severe depression was significantly high among females and stress was associated with diastolic blood pressure, TGs and dyslipidemia.

Keywords: Metabolic syndrome, Stress, Depression, Risk factors, Screening

INTRODUCTION

The metabolic syndrome is a cluster of abnormalities such as abdominal obesity, hypertension, dyslipidemia, (increased triglycerides and reduced HDL-C) and glucose intolerance which have been associated with increased risk for subclinical atherosclerosis, CVD (two fold, RR of 1.5-2.9), T2DM, target organ damage and total mortality. All these are components of metabolic

syndrome act as intermediate risk factors in the pathway for CVD and T2DM. They have 30-40% probability of developing DM and/or CHD in 20 years.^{3,4} The risk of incident and death due to CHD is about 1.5 to 2.88 in people with metabolic syndrome when compared to non-metabolic syndrome. The multiple risk factors increase the risk more than the sum of each component.⁵

Metabolic syndrome has also been suggested to be an intermediate pathway between depression and CVD wherein, chronic stress due to prolonged exposure to work stress, repeated stress over a period of time damages the HPA axis resulting in a maladaptive process as well as inflammatory factors like CRP causes depression and poor health habits leading to development of metabolic syndrome. ^{6,7}

Depression is a complex condition characterized by disruptions in all facets of life-social, psychological, behavioural and biological. The psychological stress is associated in a dose response manner with metabolic syndrome however, extreme stressful life events related to finance and chronic work stress, are more likely to have the metabolic syndrome than other stressful events.⁸-¹⁰ Stress also induce some psychosocial factors like change in sleep pattern and depression which dysregulate the HPA axis and ANS system affecting the neuro endocrine and autonomic function by increasing the cortisol (activating the HPA axis), catecholamine's and IL-6 output respectively and predisposing to metabolic syndrome. Thus, chronic psychological stress, depression and obesity result in the pathophysiological changes which reduces resilience and disturbs homoeostasis resulting in insulin resistance obesity, increased TGs, IGT and systolic/diastolic blood pressure and finally metabolic syndrome. 9,10

Studies across the world have revealed that the prevalence of stress and psychiatric morbidity to be very high among school teachers as compared to other professional groups which, has adverse effects on health resulting in reduces quality of life as well as adversely affects the students and their learning environment. Also, the prevalence of metabolic syndrome varies from 11% to 41% in India, depending on the definition used ethnicity of the population and place of residence. 14

Considering the level of work stress among teachers and the association of stress and depression with metabolic syndrome, the present study was conducted with the objectives of studying the influence of stress and depression on metabolic syndrome and its components among secondary school teachers.

METHODS

This cross sectional study was done in Mysore city, with 213 secondary schools and 1924 secondary school teachers working in these schools. 300 secondary school teachers aged 20 years and above, with at least one year of teaching experience and who gave consent to participate in the study were included.

Sample size was estimated based on CURES 2006 Chennai study which reported a prevalence of 25.8% Metabolic syndrome according to International Diabetic federation (IDF) criteria. Relative allowable error of 20% was considered and the sample was estimated to be

288, adding 10% of non-response the final sample was 320. Off which 300 subjects were considered for analysis as their information was complete.

Multistage sampling technique was adopted where, in first step all the secondary schools in Mysore city were stratified into, Government, private aided and private unaided schools and from each of these strata teachers were selected by probability proportionate to size technique.

A self-administered, pretested and structured questionnaire based on the WHO Steps Approach for NCD evaluation was used to assess the sociodemographic profile, disease profile, level of physical activity and habits (smoking, alcohol, diet). The blood pressure and anthropometric measurements including weight, height and waist measurements were obtained using standard techniques.¹⁵ The fasting blood sample was taken for analyzing fasting blood sugar, triglycerides and HDL cholesterol levels.

Patient Health Questionnaire 9 (PHQ- 9) was used to determine level of depression. The nine items of the PHQ-9 are based directly on the nine diagnostic criteria for major depressive disorder in the DSM-IV (diagnostic and statistical manual fourth edition). Each domain has 4 subscales (0-3). No depression (0-4), mild depression (5-9), moderate depression (10-19) and severe depression (>20). ^{16,17}

Stressful life events in the past year were determined using the Gurmeet Singh's presumptive stressful life events scale (PSLES), which is an Indian adaptation of the original Holmes and Rahe's social readjustment rating schedule. The scale has adequate psychometric properties and local norms. It gives quantitative estimate of presumptive stress (weighted scores) experienced by Indian adult population. The scores assigned to each individual item varying from 0-100 and then ranked according to severity. The total scores were obtained by adding all the applicable life event scores. The scores were then categorized into no stress (0-40), mild to moderate stress (41-200) stress and severe stress (>200). 18

GHQ 28 was used to determine the mental health status (developed by Goldberg and Hiller 1979). It measures the common mental health domains of depression, anxiety, somatic symptoms and social withdrawal. Each domain is composed of four subscales (0-7). The reliability coefficient (Cornbach's alpha) is 0.95 for GHQ 28. ^{19,20} the Scoring criteria of GHQ 28 is normal (<23) and poor mental health status (>23).

The institutional ethics committee clearance, permission of the regional Deputy Director of Public Instructions DDPI, principals and the written informed consent of the teachers was obtained before starting the study.

Metabolic Syndrome was defined based on the IDF consensus 2005 criteria. Central obesity measured as waist circumference (>80 cm in females and >90 cm in males of Asian origins), is central to the diagnosis along with any two of the following criteria if present was characterised as metabolic syndrome:

- 1) Fasting blood glucose ≥100 mg/dl or previously diagnosed as diabetic,
- 2) Hypertension \geq 130/85 mmHg or previously diagnosed as hypertensive,
- 3) Dyslipidemia
 - i) Triglycerides ≥150 mg/dl and/ or,
 - ii) HDL $C \le 40 \text{mg/dl}$ in males and $\le 50 \text{ mg/dl}$ in females or previously diagnosed as dyslipidemia or on medication for the same.²

Statistical analysis

Data collected was entered in MS Excel 2010 and analyzed using SPSS version 20. Descriptive statistical measures such as mean, standard deviation for continuous variables and number and percentage for categorical variables were used. Comparison between continuous variables was done using independent "t" test and for categorical variables by using chi square test. Binary logistic regression analysis was done to see the factors which were independent predictors of metabolic syndrome. The differences and associations were interpreted as statistically significant at P<0.05.

RESULTS

General characteristics

Among the study population 112 (37.3%) and 188 (62.7%) were males and females respectively. The average age of the teachers was 44.7±9.5 years, 253 (84.3%) were married and had 15.2±9.0 years of teaching experience. 58 (19.3%), 97 (32.3%) and 145 (48.3%) the teachers belonged to government, private aided and private unaided schools respectively. Most of the teachers 195 (65%) of them lived in nuclear families.

Metabolic syndrome and the risk factors

The prevalence of metabolic syndrome was 38.3% (115) according to the IDF definition 2005. The prevalence of metabolic syndrome among males was 38.4% and females was 41.5%, the difference was statistically not significant (p>0.05). The prevalence of metabolic syndrome increased with age from 14.3% in age group 21-30 years to 56.3% in >50 years age group (p<0.001).

Obesity (68.6%) and low HDL-C (39.4%) were significantly higher in females (p<0.01). However, hypertension (59.8%), hypertriglyceridemia (179.54 \pm 88.4 mg/dl) and physical activity (16.1% and 29.4% intense and moderate activity respectively) was higher in males (p<0.001).

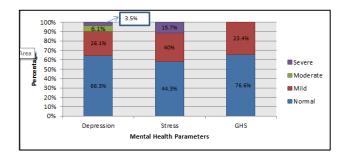


Figure 1: Distribution of subjects according to mental health status (n=300).

Mental health status and metabolic syndrome

The prevalence of mild psychiatric disorders (MPD) was in 66 (22%), mild to severe depression in 99 (33%), moderate stress in 141 (47%) and severe stress in 42 (14%) among the subjects. The present study did not show any statistically significant association between the presence of mental health parameters and metabolic syndrome. However, the prevalence of mild psychiatric disorders (MPD) and any form of depression was significantly higher among females (p<0.05), whereas level of stress was similar in both males and females.

Variable	Total, N=300	Male (112) mean, SD	Females (188) mean, SD	Test of significance
Age	44.7 years ±9.5	44.7 years ±9.53	41.2 years ±10.2	0.788
Marital status	253 (84.3%)	100 (89.3%)	153 (81.4%)	0.077
Years of teaching	15.2 years±9.0	17.6 years, 8.8 years	13.76 years, 8.8 years	0.465
Type of school				
Government	58 (19.3)	18 (16.1)	40 (21.3)	0.000
Private aided	97 (32.3)	53 (47.3)	44 (23.4)	
Private unaided	145 (48.3)	41 (36.6)	104 (55.3)	
Type of family				
Nuclear	195 (65)	76 (67.8)	119 (63.3)	0.379
Others	105 (35)	36 (32.1)	69 (36.7)	

Table 2: Biophysical profile, and mental health status of the study population.

Variable	Total, n=300	Male(112) mean, SD	Females(188) mean, SD	Test of significance
Physical activity				
Intense activity	20 (6.7)	18 (16.1)	2 (1.1)	0.001
Moderate activity	77 (25.7)	33 (29.4)	44 (57.4)	0.001
Sedentary	203 (67.7)	61 (54.5)	142 (75.5)	
Obesity (WC)				
Normal	110 (36.7)	51 (45.5)	59 (31.4)	0.014
Obese	190 (63.3)	61 (54.5)	129 (68.6)	
BMI	25.7±4.9	24.32±3.16	26.55±0.41	0.000
Systolic blood pressure	123±15.9	128.45±13.43	120.58±16.41	0.01
Diastolic blood pressure	80.1±10.2	83.9±9.24	77.86±10.1	0.001
Triglycerides	149±78.4	179.54±88.4	131.53±65.87	0.001
HDL-C	00 (20 70/)	10 (17 1)	74 (20.4)	0.000
Reduced HDL-C level	92 (30.7%)	18 (16.1)	74 (39.4)	0.000
Fasting blood glucose	93.1±31.8	98.36±38.43	90.1±0.73	0.247
Diabetes	66 (22)	32 (27.6)	44 (23.4)	0.408
Hypertension	133 (44.3)	67 (59.8)	66 (35.1)	0.000
Dyslipidemia	176 (58.7)	72 (64.3)	104 (55.3)	0.127
MS	115 (38.3)	43 (38.4)	78 (41.5)	0.53
GHQ				
<23	234 (78)	96 (85.7)	138 (73.4)	0.013
>23	66 (22)	16 (14.3)	50 (26.6)	
PSLES				
No stress	117 (39)	45 (40.2)	72 (38.3)	0.925
Moderate stress	141 (47)	51 (45.5)	90 (47.9)	0.923
Severe stress	42 (14)	16 (14.3)	26 (13.8)	
PHQ				
Normal	201 (67)	84 (75)	117 (62.2)	
Mild	75 (25)	23 (20.5)	52 (27.6)	0.05
Moderate	17 (5.6)	5 (4.5)	12 (6.4)	
Severe	7 (2.3)	0 (-)	7 (3.7)	

Table 3: Distribution of study participants according to mental health parameters and metabolic syndrome.

Variable	Metabolic Syndron	ne	— Total—200	v ² D volvo
Variable	Absent (n=185) Present (n=115)		Total=300	χ², P value
Depression				
Normal	127 (63.2)	74 (36.8)	201(67.0)	$\chi^2 = 1.39$,
Mild depression	45 (60.0)	30 (40.0)	75 (25.0)	χ = 1.39, P 0.708
Moderate depression	10 (58.8)	7 (41.2)	17 (5.6)	P 0.708
Severe depression	3 (42.9)	4 (57.1)	7 (2.3)	
General health status				2 0.227
Normal	146 (62.4)	88 (37.6)	234 (78.0)	$\chi^2 = 0.237,$ P 0.63
Poor health status	39 (59.1)	27 (40.9)	66 (22.0)	P 0.03
Stress				
No stress	66 (56.4)	51 (43.6)	117 (39.0)	.2-4.44
Moderate stress	95 (67.1)	46 (32.9)	141 (47.0)	$\chi^2 = 4.44,$ P 0.108
Severe stress	24 (57.1)	18 (42.9)	42 (14.0)	P 0.108

Depression

In the present study majority of them 201 (67.0%) were normal, 92 (30.6%) had mild to moderate depression and only 07 (2.3%) had severe depression. The prevalence of any form of depression was about 33% among them 9.3% were men and 23.6% were women who had some form of depression. All the subjects with severe depression 100% (7) and 75.6% (28) with mild to moderate depression were females, and the difference in prevalence of depression among males and females was statistically significant (p=0.017). The middle aged people in the age group 31-50 years were more depressed 33.7% and 30.4%. Mild to moderate depression was seen more among married people (p=0.069) and those living in nuclear families (p=0.074).

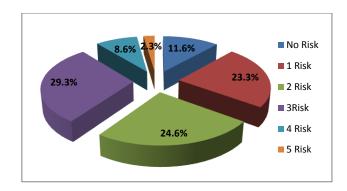


Figure 2: Distribution of study participants according to number of risk factors present.

Table 4a: Association of socio demographic factors with depression.

			Depression		
Variable	No depression (201)	Mild-mod depression (92)	Severe depression (07)	Total, n= 300	p
Age					
21-30 years	30 (14.9)	10 (10.9)	2 (28.6)	42 (14.0)	
31-40 years	59 ((29.4)	31 (33.7)	2 (28.6)	92 (30.7)	0.781
41-50 years	66 (32.8)	28 (30.4)	1 (14.3)	95 (31.7)	0.761
>50 years	46 (22.8)	23 (25)	2 (28.6)	71 (23.7)	
Sex					
Male	84 (41.8)	28 (30.4)	0	112 (37.3)	0.017
Female	117 (58.2)	64 (69.6)	7 (100)	188 (62.7)	
Marital Status					
Married	166 (82.6)	82 (89.1)	5 (71.4)	253 (84.3)	0.060
Single	30 (14.9)	6 (6.5)	1 (14.3)	37 (12.3)	0.069
others	5 (2.5)	4 (4.3)	1 (14.3)	10 (3.3)	
Type of school					
Govt	38 (18.9)	16 (17.4)	4 (57.1)	58 (19.3)	
Private Aided	69 (34.3)	26 (28.3)	2 (28.6)	97 (32.3)	0.096
Private Unaided	94 (46.7)	50 (54.3)	1 (14.3)	145 (48.3)	
Years of teaching					
<10 years	72 (35.8)	26 (28.3)	2 (28.6)	100 (33.3)	0.67
10-20 years	77 (38.3)	43 (46.7)	3 (42.9)	123 (41.0)	0.67
>20 years	52 (25.9)	23 (25)	2 (28.6)	77 (25.6)	
Type of family					
Nuclear	131(65.2)	60 (65.2)	4 (57.1)	195 (65.0)	
Joint	55 (27.4)	17 (18.5)	3 (42.9)	75 (25.0)	0.074
Others	15 (7.5)	15 (16.3)	0	30 (10.0)	

Metabolic syndrome and depression

Among those who had metabolic syndrome 74 (64.3%) had no depression whereas, 37 (32.2%) and 4 (3.5%) of the subjects had mild to moderate and severe depression respectively. This difference was statistically not significant (p>0.05). Though factors like sex (p<0.05), marital status and type of school and family affected the mental health status but was found statistically significant

at 10% significance in the whole population and in those having MS only the type of family had significant influence (p=0.026).

The prevalence of metabolic syndrome (36.8%, 40.2% and 57.2%) and its risk factors like BMI (51.7%, 52.2% and 71.4%), dyslipidemia (46.8%, 44.4% and 57.2%), level of physical inactivity (66.6%, 68.5% & 85.7%), obesity (63.2%, 63.1% & 71.4%) and low HDL-C

(30.4%, 30.4% & 42.8) among subjects with no depression, mild to moderate depression and severe depression respectively. Though, there is influence of

depression on the metabolic syndrome risk factors, the present study could not establish statistical significance (p>0.05).

Table 4b: Association of metabolic syndrome risk factors with depression.

	Depression				
Variable	No depression (201)	Mild-mod depression (92)	Severe depression (07)	Total n=300	p
Physical Inactivity					
Intense activity	16 (7.9)	04 (4.3)	0	20 (6.7)	0.772
Moderate activity	51 (25.4)	25 (27.2)	1 (14.3)	77 (25.6)	0.772
Sedentary	134 (66.6)	63 (68.5)	6 (85.7)	203 (67.7)	
Obesity (WC)					
Normal	74 (36.8)	34 (36.9)	2 (28.6)	110 (36.7)	1.0
Obese	127 (63.2)	58 (63.1)	5 (71.4)	190 (63.3)	1.0
BMI					
Normal	54 (26.8)	31 (33.6)	0	85 (28.3)	
overweight	43 (21.4)	13 (14.1)	2 (28.5)	58 (19.3)	0.191
Obese	104 (51.7)	48 (52.2)	5 (71.4)	157 (52.3)	
Systolic blood pressure					
Normal	130 (64.7)	59 (64.1)	6 (85)	195 (65.0)	0.612
Hypertension	71 (35.3)	33 (35.8)	1 (15)	105 (35.0)	0.012
Diastolic blood					
pressure					
Normal	145 (72.1)	64 (69.6)	6 (85)	215 (71.7)	0.637
Hypertension	56 (27.8)	28 (30.4)	1 (15)	85 (28.3)	
Triglycerides					
Normal	115 (57.2)	59 (64.1)	3 (42.8)	177 (59.0)	0.361
Increased	86 (42.8)	33 (35.9)	4 (57.2)	123 (41.0)	0.301
HDL-C					
Normal	140 (69.6)	64 (69.4)	4 (57.2)	208 (69.3)	0.813
Decreased	61 (30.4)	28 (30.4)	3 (42.8)	92 (30.7)	0.013
Diabetes					
Absent	159 (79.1)	69 (75)	6 (85)	234 (78.0)	0.644
Present	42 (20.8)	23 (25)	1 (15)	66 (22.0)	0.044
Hypertension					
Absent	107 (53.2)	46 (50)	4 (57.2)	157 (52.3)	0.838
Present	94 (46.7)	46 (50)	3 (42.8)	143 (47.7)	0.030
Dyslipidemia					
Absent	107 (53.2)	51 (55.5)	3 (42.8)	161 (53.7)	0.812
Present	94 (46.8)	41 (44.4)	4 (57.20)	139 (46.3)	
Metabolic syndrome					
Absent	127 (63.2)	55 (59.8)	3 (42.8)	185 (61.6)	0.518
Present	74 (36.8)	37 (40.2)	4 (57.2)	115 (38.4)	0.516

In those having metabolic syndrome, the level of physical inactivity (58.2%, 62.2% & 75%), systolic blood pressure (60.8%, 64.9% & 25%) low HDL-C (43.2%, 54.3% & 50%), increased TGs (72.9%, 64.8% & 100%) and

diabetes (39.1%, 54.1% & 25%) increased with the degree of depression, though the association was statistically not significant (p>0.05). However, increasing degree of depression was associated with BMI (p=0.053).

Table 5a: Association of socio demographic factors with depression among teachers having metabolic syndrome.

Variable		Depression			
Variable	No depression (74)	Mild-mod depression (37)	Severe depression (04)	Total, n= 115	p
Age					
21-30 years	5 (6.8)	-	1 (25)	6 (5.2)	
31-40 years	17 (23)	9 (24.3)	-	26 (22.6)	0.32
41-51 years	26 (35.1)	16 943.2)	1 (25)	43 (37.4))	0.32
>50 years	20 (27.1)	12 (32.4)	2 (50)	40 (34.9)	
Sex					
Male	31 (41.9)	9 (24.3)	0	40 (34.9)	0.063
Female	43 (58.1)	28 (75.3)	4 (100)	75 (65.2)	0.005
Marital Status					
Married	67 (90.5)	34 (91.9)	4 (100)	105 (91.3)	
others	7 (9.5)	3 (8.1)	-	10(8.7)	
Type of School					
Government	17 (23)	10 (27.1)	3 (75)	30 (26.1)	
Private aided	26 (35.1)	8 (21.6)	1 (25)	35 (30.4)	0.102
Private unaided	31 (41.9)	19 (51.4)	-	50 (43.5)	
Type of Family					
Nuclear	48 (64.8)	23 (62.2)	1 (25)	72 (62.6)	
Joint	24 (32.4)	8 (21.6)	3 (75)	35 (30.4)	0.026
Others	2 (2.7)	6 (16.2)	-	8 (6.9)	

Table 5b: Association of metabolic syndrome risk factors with depression among teachers having metabolic syndrome.

Variable	Depression, n= 115					
Variable	No depression (74)	Mild-Mod depression(37)	Severe depression (04)	Total	р	
Physical Inactivity						
Intense activity	2 (2.7)	1 (2.9)	-	3 (2.6)	0.973	
Moderate activity	24 (32.4)	13 (35.1)	1 (25)	38 (33.1)	0.973	
Sedentary	48 (58.2)	23 (62.2)	3 (75)	74 (64.3)		
BMI						
Normal	3 (4.1)	5 (13.5)	-	8 (6.9)	0.053	
Overweight	10 (13.5)	2 (5.4)	2 (50)	14 (12.2)	0.055	
Obese	61 (82.4)	30 (81.1)	2 (50)	93 (80.9)		
Systolic blood pressure						
Normal	29 (39.2)	13 (35.1)	3 (75)	45 (39.1)	0.381	
Hypertension	45 (60.8)	24 (64.9)	1 (25)	70 (60.9)		
Diastolic blood pressure						
Normal	38 (51.4)	16 (43.3)	3 (75)	57 (49.5)	0.447	
Hypertension	36 (48.9)	21 (56.7)	1 (25)	58 (50.5)		
Triglycerides						
Normal	20 (27.1)	13 (35.2)	-	33 (28.7)	0.34	
Increased	54 (72.9)	24 (64.8)	4 (100)	82 (71.3)		
HDL-C						
Normal	42 (56.7)	21 (56.7)	2 (50)	65 (56.2)	1.00	
Decreased	32 (43.2)	16 (34.3)	2 (50)	50 (43.5)	1.00	
Diabetes						
Absent	45 (56.7)	17 (45.9)	3 (75)	65 (56.2)	0.296	
Present	29 (39.1)	20 (54.1)	1 (25)	50 (43.5)	0.290	
Hypertension						
Absent	20 (27)	11 (29.7)	3 (75)	34 (29.6)	0.135	
Present	54 (73)	26 (70.3)	1 (25)	81 (70.4)		
Dyslipidemia						
Absent	38 (51.3)	19 (51.3)	2 (50)	59 (51.3)	1.00	
Present	36 (48.6)	18 (48.6)	2 (50)	56 (48.7)	1.00	

Table 6a: Association of socio demographic factors with stress.

Variable	No-mild stress (n=117)	Moderate stress (n=140)	Severe stress (n=42)	Total N =300	p
Age					
21-30 years	14 (11.9)	24 (17.1)	4 (9.5)	42 (14.0)	
31-40 years	32 (27.3)	45 (32.1)	14 (33.3)	92 (30.7)	0.458
41-50 years	45 (38.5)	37 (26.4)	13 (30.9)	95 (31.7)	
>50 years	26 (22.2)	34 (24.3)	11 (26.2)	71 (23.7)	
Sex					
Male	45 (38.5)	50 (35.7)	16 (38.1)	112 (37.3)	
Female	72 (61.5)	90 (64.3)	26 (61.9)	188 (62.7)	0.893
Marital status					
Married	98 (83.8)	116 (82.8)	38 (90.5)	253 (84.3)	
Single	17 (14.5)	18 (12.9)	2 (4.8)	37 (12.3)	0.324
Others	2 (1.7)	6 (4.3)	2 (4.8)	10 (3.3)	
Type of school					
Government	23 (19.6)	26 (18.6)	9 (21.4)	58 (19.3)	
Private aided	40 (34.2)	51 (36.4)	6 (14.3)	97 (32.3)	0.097
Private unaided	54 (46.1)	63 (45)	27 (64.3)	145 (48.3)	
Years of teachin	g				
<10 years	33 (28.2)	53 (37.8)	13 (30.9)	100 (33.3)	
10-20 years	51 (43.6)	53 (37.8)	19 (45.2)	123 (41.0)	0.554
>20 years	33 (28.2)	34 (24.3)	10 (23.8)	77 (25.6)	
Type of family					
Nuclear	74 (63.2)	92 (65.7)	28 (66.6)	195 (65.0)	
Joint	32 (27.3)	30 (21.4)	13 (30.9)	75 (25.0)	0.262
Others	11 (9.4)	18 (12.9)	1 (2.4)	30 (10.0)	

Table 6b: Association of Metabolic syndrome risk factors with Stress

			Stress		
Variable	No-mild Stress (n=117)	Moderate stress (n=140)	Severe stress (n=42)	Total N=300	p
Physical Inactivity					
Intense activity	7 (6)	10 (7.1)	3 (7.1)	20 (6.7)	
Moderate activity	31 (26.5)	33 (23.6)	26 (61.9)	77 (25.6)	0.881
Sedentary	79 (67.5)	98 (70)	13 (30.1)	203 (67.7)	
Obesity (WC)					
Normal	37 (31.6)	57 (40.7)	15 (35.7)	110 (36.7)	.319
Obese	80 (68.4)	83 (59.3)	27 (64.3)	190 (63.3)	.519
BMI					
Normal	27 (23.1)	46 (32.8)	11 (26.1)	85 (28.3)	
Overweght	24 (20.5)	25 (17.9)	9 (21.4)	58 (19.3)	.527
Obese	66 (56.4)	69 (58.9)	22 (52.4)	157 (52.3)	
Systolic Blood Pressure					
Normal					
Hypertension	75 (64.1)	97 (69.3)	22 (52.4)	195 (65.0)	0.129
Trypertension	42 (35.8)	43 (30.7)	20 (47.6)	105 (35.0)	0.129
Diastolic Blood pressure					
Normal	78 (66.6)	109 (77.8)	27 (64.3)	215 (71.7)	0.074
Hypertension	39 (33.3)	31 (22.1)	15 (35.7)	85 (28.3)	0.074
Triglycerides					
Normal	65 (55.5)	92 (65.7)	20 (47.6)	177 (59.0)	0.066
Increased	52 (44.4)	48 (34.3)	22 (52.4)	123 (41.0)	0.000
HDL-C					
Normal	80 (68.4)	96 (68.6)	32 (76.2)	208 (69.3)	0.602

Decreased	37 (31.6)	44 (31.4)	10 (23.8)	92 (30.7)	
Diabetes					
Absent	93 (79.5)	110 (78.6)	31 (73.8)	234 (78.0)	0.741
Present	24 (20.5)	30 (21.4)	11 (26.2)	66 (22.0)	0.741
Hypertension					
Absent	57 (48.7)	81 (57.9)	19 (45.2)	157 (52.3)	0.205
Present	60 (51.3)	59 (42.1)	23 (54.8)	143 (47.7)	
Dyslipidemia					
Absent	62 (52.9)	88 (62.8)	14 (33.3)	161 (53.7)	0.007
Present	55 (47.1)	55 (39.2)	28 (66.6)	139 (46.3)	
Metabolic syndrome					
Absent	66 (56.4)	94 (67.1)	24 (57.1)	185 (61.6)	0.174
Present	51 (43.6)	46 (32.8)	18 (42.8)	115 (38.4)	

Table 7a: Association of socio demographic factors with stress among teachers having MS.

Variable	No mild stress (n=51)	Moderate stress (n=40)	Severe stress (n=18)	Total n=115	p
Age					
21-30 years	3 (5.8)	3 (7.5)	-	6 (5.2)	
31-40 years	10 (19.6)	10 (25)	6 (33.3)	26 (22.6)	0.455
41-50 years	24 (47.1)	14 (35)	5 (27.9)	43 (37.4)	0.455
>50 years	14 (27.4)	19 (47.5)	7 (38.8)	40 (34.9)	
Sex					
Male	20 (39.2)	15 (37.5)	5 (29.7)	40 (34.9)	(20
Female	31 (60.8)	31 (77.5)	13 (72.2)	75 (65.2)	.628
Marital status					
Married	45 (88.2)	43	17 (94.4)	105 (91.3)	0.662
Single/others	6 (11.8)	3	1 (5.6)	10 (8.7)	0.663
Type of school					
Government	14 (27.5)	12 (26.1)	4 (22.2)	30 (26.1)	
Private aided	14 (27.5)	17 (36.9)	4 (22.2)	35 (30.4)	0.669
Private unaided	23 (45.1)	17 (36.9)	10 (55.5)	50 (43.5)	0.668
Type of family					
Nuclear	32 (62.7)	31 (67.4)	9 (50)	72 (62.6)	
Joint	16 (31.4)	10 (21.7)	9 (50)	35 (30.4)	0.200
Others	3 (5.8)	5 (10.9)	-	8 (6.9)	0.200

Table 7b: Association of Metabolic syndrome risk factors with stress among teachers having metabolic syndrome.

	Stress						
Variable	No-mild stress (n= 51)	Moderate stress (n= 40)	Severe stress (n= 18)	Total n= 115	p		
Physical Inactivity							
Intense activity	2 (3.9)	-	1 (5.5)	3 (2.6)			
Moderate activity	14 (27.4)	19 (41.3)	5 (27.7)	38 (33.1)	0.329		
Sedentary	35 (68.6)	27 (58.7)	12 (66.6)	74 (64.3)			
BMI							
Normal	3 (5.8)	5 (10.5)	-	8 (6.9)			
Overweight	7 (13.7)	6 (13.1)	01 (5.5)	14 (12.2)	0.569		
Obese	41 (80.4)	35 (76.1)	17 (94.4)	93 (80.9)			
Systolic blood pressure							
Normal	21 (41.2)	19 (41.3)	5 (27.7)	45 (39.1)	0.561		
Hypertension	30 (52.9)	21 (58.7)	13 (72.2)	70 (60.9)	0.561		
Diastolic blood pressure					0.880		
Normal	24 (47.1)	24 (52.2)	9 (50)	57 (49.5)	0.880		

27 (52.9)	22 (47.8)	9 (50)	58 (50.5)	
15 (29.4)	16 (34.8)	2 (11.1)	33 (28.7)	0.168
36 (70.6)	30 (65.2)	16 (88.8)	82 (71.3)	
28 (54.9)	26 (56.5)	11 (61.1)	65 (56.2)	0.901
23 (45.1)	20 (43.5)	7 (38.8)	50 (43.5)	
31 (60.7)	23 (50)	11((61.1)	65 (56.2)	0.515
20 (39.2)	23 (50)	7 (38.8)	50 (43.5)	
13 (25.5)	17 (36.9)	4 (22.2)	34 (29.6)	0.354
38 (74.5)	29 (63.1)	14 (77.7)	81 (70.4)	
26 (51.1)	29 (63.1)	4 (22.2)	59 (51.3)	0.013
25 (49.1)	17 (36.9)	14 (77.7)	56 (48.7)	0.013
	15 (29.4) 36 (70.6) 28 (54.9) 23 (45.1) 31 (60.7) 20 (39.2) 13 (25.5) 38 (74.5) 26 (51.1)	15 (29.4) 16 (34.8) 36 (70.6) 30 (65.2) 28 (54.9) 26 (56.5) 23 (45.1) 20 (43.5) 31 (60.7) 23 (50) 20 (39.2) 23 (50) 13 (25.5) 17 (36.9) 38 (74.5) 29 (63.1) 26 (51.1) 29 (63.1)	15 (29.4) 16 (34.8) 2 (11.1) 36 (70.6) 30 (65.2) 16 (88.8) 28 (54.9) 26 (56.5) 11 (61.1) 23 (45.1) 20 (43.5) 7 (38.8) 31 (60.7) 23 (50) 11 ((61.1) 20 (39.2) 23 (50) 7 (38.8) 13 (25.5) 17 (36.9) 4 (22.2) 38 (74.5) 29 (63.1) 14 (77.7) 26 (51.1) 29 (63.1) 4 (22.2)	15 (29.4) 16 (34.8) 2 (11.1) 33 (28.7) 36 (70.6) 30 (65.2) 16 (88.8) 82 (71.3) 28 (54.9) 26 (56.5) 11 (61.1) 65 (56.2) 23 (45.1) 20 (43.5) 7 (38.8) 50 (43.5) 31 (60.7) 23 (50) 11 ((61.1) 65 (56.2) 20 (39.2) 23 (50) 7 (38.8) 50 (43.5) 13 (25.5) 17 (36.9) 4 (22.2) 34 (29.6) 38 (74.5) 29 (63.1) 14 (77.7) 81 (70.4) 26 (51.1) 29 (63.1) 4 (22.2) 59 (51.3)

DISCUSSION

The present study also is similar to the earlier studies wherein the influence of depression and stress on metabolic syndrome is evident, but a statistical association could not be established. Though, the study showed that risk of MS increased with age and the risk factors were significantly associated with MS. TG, low HDL-C and BMI were found to be independent predictors of Metabolic Syndrome among the teachers.

According to the study the prevalence of any form of depression was about 33% in the present study. 9.3% of men and 23.6% of women had some form of depression; however those having severe depression were all females (100%).

The metabolic syndrome and some of its components like obesity and dyslipidemia was higher in subjects with increasing severity of depression, however was statistically not significant. Similarly Nicole V et al. study did not find any statistically significant association between the severity of depressive symptoms and metabolic syndrome (OR 1.20, 95%-CI=1.02-1.41). However, large waist circumference, high triglycerides levels and low HDL levels were significantly associated with higher cortisol levels in the depressed group (β =0.178, p=0.02; β =0.247, p=0.001; β = -0.156, p=0.04, respectively).

Viola Vaccarino et al revealed the number of metabolic syndrome risk factors increased gradually across the three depression categories (p 0.003) in women with suspected coronary artery disease. Hypertension, triglyceride levels and waist circumference were those most strongly associated with depression and those with depression had two times risk of metabolic syndrome.²¹

Similarly the study among police officers in New York city showed that depression added to the risk of obesity

(OR=1.34), triglyceride (OR=1.476), glucose intolerance (OR=1.567) and hypertension (OR=1.518).⁶ However, our study showed that depression added to the risk of having Metabolic syndrome (OR=1.21), diabetes mellitus (OR=1.21), hypertension (OR=1.14) and physical inactivity (OR=2.05).

A meta-analysis by Bariana Mazuk shows that depression is associated with a 60% increase in risk of developing type 2 diabetes rivals other known risk factors for this disease. According to the Mac Andrew systematic review of metabolic syndrome and insulin resistance increases 6-7 fold rise in diabetes incidence. The present study shows that the odds for developing diabetes with depression is about 21% (OR 1.211, 95% CI=0.972-1.59). Thus, with the presence of depression will add to the risk of diabetes.

In the present study, 43.6% of the subjects without stress, 32.9% and 42.9% with mild and severe stress were observed to have Metabolic Syndrome (p>0.05). 13.8% and 14.4% of females and males had severe stress and 47.9% and 45.0% of the females and males among the study subjects had moderate stress. The odds for developing metabolic syndrome with any form of stress (OR 1.425, 95% CI = 0.982-1.868). The Whitehall II study, showed people with chronic work stress were twice likely to develop metabolic syndrome than those without work stress (OR=2.25, 95% CI=1.31-3.85).

The present study also shows a higher odds for obesity (OR 1.415, 95% CI= 1.166-1.664), triglycerides (OR 1.28, 95% CI=1.04-1.52), hypertension (OR 1.28, 95% CI=1.04-1.52), though the association was not statistically significant. Stressful life events related to finance, health and workload were associated with insulin resistance, obesity and triglycerides had a higher odds for having IGT however, stress did not associate significantly with IFG, HDL cholesterol, or blood pressure. 9,10

However the present study showed that higher level of stress was associated with higher prevalence of systolic hypertension (52.9%, 58.7% & 72.2%), increased TGs (70.6%, 65.2% & 88.8%) dyslipidemia (49.1%, 36.9% & 77.7%) and diabetes (39.2%, 50.0% & 38.8%) among those with metabolic syndrome. Stress was not significantly associated with any of the risk factors identified in the present study population.

However, the study showed similar trend in prevalence of depression and stress, risk factors of metabolic syndrome among those with some form of depression and stress, though the association between could not be statistically established except for stress and dyslipidemia.

CONCLUSION

The earlier research has established that there is increase in occurrence of life stress before the onset of major depression and also metabolic syndrome as an intermediate stage between depression and CVD. The current study has a prevalence of moderate to severe depression, stress and the risk factors components of MS was similar to other populations. The poor mental health status was significantly high among females and was associated with high fasting blood glucose levels. Though, the present study did not show any statistical association between the mental health status and the occurrence of MS or its components except severity of stress was related to dyslipidemia and depression with obesity. It clearly indicates that the risk factors are influenced by stress and depression, which are a necessary evil of modernization and urbanization of the communities.

As nearly 50-60% of the mortality in the developing countries is due to NCDs especially CVDs, affecting the younger and economically productive population. This not only increases the cost of health care in turn increases the burden on weak health care systems and the economy as a whole. Thus, workplace screening of the employees will help in creating a platform for creating awareness introduction of lifestyle modification interventions. The screening for NCDs should include evaluation of mental health parameters as well, for holistic approach to health. These efforts into primary prevention by the developing countries will not only be cost effective, they will help in developing sustainable communities.

The studies that have correlated the stress and depression with metabolic syndrome are based on blood levels of cortisol, thus there is a need to further explore the hypothesis based on questionnaire such that it can be part of screening programmes and feasible for low and middle income countries.

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