



## IS THERE ANY RELATIONSHIP BETWEEN DEPRESSION AND HYPOTHYROIDISM? A COMMUNITY BASED STUDY AMONG ADULT WOMEN IN A RURAL AREA OF WEST BENGAL

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### ABSTRACT

**Background:** Depression is the most common psychiatric disorder and it is estimated to affect 340 million people globally

**Objective:** To find out the prevalence and predictors of depression

**Methodology:** An observational ,community based cross-sectional study was conducted over a period of 2 years from September 2016 to October 2018 among adult women in a rural area of West Bengal. Depression and its various predictors were assessed using structured schedule.

**Results:** In univariate logistic regression depression was significantly associated with increasing age (OR=1.06(1.02, 1.07), stress (OR=1.71(1.02, 2.88) and menopause (OR= 1.96(1.04, 2.98) but they lost their significance in multivariable binomial logistic regression. Multi variable logistic regression analysis reveals that depression is significantly associated with hypothyroidism (AOR=1.96(1.02, 3.14) ,impaired glycaemic status (AOR=1.86(1.01, 2.78) and high BMI( >25 kg/m<sup>2</sup>) (AOR=1.91(1.03, 2.67).Conclusion: As depression is multifactorial,so more studies analyzing these factors are required in future to understand the problem of depression better.

### KEYWORDS : Depression,Hypothyroidism

#### INTRODUCTION

Depression is an illness that affects both the mind and the body and is a leading cause of disability, workplace absenteeism, decreased productivity and high suicide rates<sup>[1,2]</sup>. Depression is the most common psychiatric disorder in general practice and about one in ten patients seen in the primary care settings suffer from some form of depression<sup>[3,4]</sup>. In a study by the World Health Organization (WHO) conducted at 14 sites, the most common diagnosis in primary care was depression<sup>[5]</sup>.

Depression is estimated to affect 340 million people globally<sup>[6]</sup>. The prevalence of psychiatric disorders is reported to differ between countries and within countries, across various ethnicities<sup>[7]</sup>. Most studies on depression are from the developed world and there are few studies from developing countries. Earlier Indian studies have reported prevalence rates of depression that vary from 21–83% in primary care practices.

There are some people who periodically or chronically remain in a depressed state in spite of their having all social privileges and material comforts, severely compromising all their functions, culminating in about 15% of cases in suicide. A tragic fatality associated with the loss of about 1 million lives worldwide every year.<sup>[8]</sup>

According to World Health Report in 1998 an estimated 39% of all Disability-Adjusted Life Year (DALY) lost in low and middle-income countries were attributable to non-communicable diseases of which 10% of the disease burden is due to neuropsychiatric conditions. A large proportion of the burden of disease resulting from neuropsychiatric conditions is attributable to unipolar major depression. In adults aged 15-44 years, neuropsychiatric conditions are the leading cause of DALYs lost worldwide. The disease burden resulting from depression is estimated to be increasing both in developing and developed regions.<sup>[8]</sup>

In addition, research indicates that depression onset is occurring earlier in life today than in past decades.<sup>[9]</sup> The reasons for this could be the result of rapid urbanization and life style changes. Evidence suggests that early intervention for depression can improve long-term outcomes.<sup>[10]</sup>

While depression and its effects have been studied in many different

population groups and subgroups, the extent of this problem and the determinants of this problem have not been well documented. Most of the women here were home makers of a marginalized deprived and underprivileged population on whom very few such studies have been conducted. Assessment of thyroid function status at community level among such women is a rare activity and this has been achieved in this study to determine any relationship between hypothyroidism and depressive state and other risk factors.

#### MATERIALS AND METHODS

An observational ,community based cross-sectional study was conducted over a period of 2 years from September 2016 to October 2018 in a rural area of West Bengal, India, which is the service area of Rural Health Unit and Training Centre under All India Institute of Hygiene and Public Health,Kolkata.. Ethical clearance from the institutional Ethics Committee was obtained.

#### Sample size

$$N = \frac{(Z_{1-\alpha/2})^2 pq}{L^2}$$

Sample size were 315, taking 5% as absolute error, p=24.7 (according to a study conducted on Status of Thyroid Function in Indian Adults: Two Decades After Universal Salt Iodization by Raman Kumar Marwaha et al in 2012).<sup>[11]</sup>

(p = prevalence (24.7), q = 100-p (75.3), L = allowable error (5%), Z<sub>1-α/2</sub> for Confidence level 95% = 1.96)

$$N = \frac{(1.96 \times 1.96 \times 24.7 \times 75.3)}{5 \times 5} = 286$$

Taking 10% as non-response i.e 286 + 29 = 315

Final minimum sample size was = 315

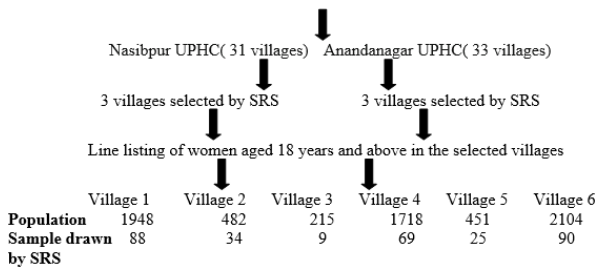
**Thus, 315 female residents were selected for the study.**

#### Sampling design:

RHUTC, Singur is the rural field practice area of All India Institute of Hygiene and Public Health (AIHH & PH), Kolkata which covers 64 villages through two Union Primary Health Centres. Simple Random sampling was done at the various stages.. In the first stage, 3 villages were selected randomly from the villages under each of the two UPHC. Sampling frame of women aged 18 years and above was prepared from the voters lists of the selected villages. After calculating the number of participants from each village, required number of samples as per Population Proportionate to Size were drawn from the sampling frame of each village by simple random sampling. If the selected individual

did not meet the selection criteria, had not given consent or was unable to contact after two visits, simple random sampling without replacement was done to select another study participant.

RHU&TC, Singur(2 UPHC)



A total of 315 adult women (> 18 years) residing in the study area and agreed to give informed consent were enrolled in the study.

**Study tool and study Technique**

A predesigned and pretested structured schedule was used to collect data on

- Sociodemographic and behavioral characteristics and status of depression(PHQ-4 questionnaire) by interview method
- Assessment of thyroid dysfunction, Hypercholesterolaemia and Impaired glycaemic was done by blood examination
- Assessment of BMI was done by anthropometric measurement.

**Data analysis**

Statistical package for social sciences (SPSS) version 16 was used for the analysis of data. Measures of central tendency and dispersion were used to summarize numerical data and proportions to summarize categorical variables. The association between depression and different variables was estimated in univariate and multivariable logistic regression. Odds ratio with 95% confidence interval was computed. Explanatory variables found to be statistically significant in univariate logistic regression were entered into multivariable logistic regression. Value of p<0.05 was considered to be statistically significant.

**RESULTS**

**Table 1: Distribution of study participants according to socio-demographic characteristics (n=315)**

Variable	No(%)
Age in completed years	
18-33 years	86(27.3)
34-49 years	134(42.5)
50-65 years	74(23.5)

**Table 2: Association between Hypothyroidism and Depression (n=315)**

Hypothyroidism	Depression		Total	$\chi^2=6.07$ df=1 p=0.014
	(Yes)	(No)		
Yes	28(36.8)	54(22.6)	82(26.0)	
No	48(63.2)	185(77.4)	233(74.0)	
Total	76(24.2)	239(75.8)	315(100%)	

**Table 3 : Factors associated with Depression : Univariate and multivariable binomial logistic regression (n=315)**

Variables		Depression-No(%)	OR(95% CI)	P value	AOR	P value
<b>Age</b>	(↑)		1.06(1.02, 1.067)	0.037	1.01(0.94, 1.08 )	0.11
<b>Religion</b>	Hindu (272)	68(25.0)	1.07(0.512, 2.24)	0.85	-	-
	Muslim (43)	8(18.6)				
<b>Education</b>	(↑)	-	0.957(0.886, 1.03)	0.26	-	-
<b>Family type</b>	Joint (249)	62(24.9)	1.20(0.653, 2.23)	0.54	-	-
	Nuclear(66)	14(21.2)	1			
<b>PCI</b>	< 50 <sup>th</sup> percentile (146)	39(26.7)	1.21(0.726, 2.03)	0.45	-	-
	>50 <sup>th</sup> percentile (169)	37(21.8)	1			
<b>Chewing tobacco</b>	Yes (73)	30(41.1)	1.57(0.90, 3.11)	0.10	-	-
	No (242)	46(19.0)	1			
<b>Physical activity</b>	Low (103)	30(29.1)	1.56(0.867, 2.26)	0.21	-	-
	High (212)	46(21.7)	1			
<b>Stress</b>	(↑)	-	1.71(1.02, 2.88)	0.04	1.56(0.986, 2.56)	0.15
<b>Impaired glycaemic status</b>	Yes (138)	50(36.2)	1.90(1.04, 2.96)	0.03	1.86(1.01, 2.78)	0.04
	No (177)	26(14.6)	1		1	
<b>Menopause</b>	Yes (110)	52(47.3)	1.96( 1.04, 2.98)	0.03	1.56(0.915, 2.12)	0.12
	No (205)	24(11.7)	1			

>=66 years	21(6.7)
Total	315(100%)
Mean: 44.19; SD: 13.68; Median: 42.0; IQR: 33– 51; Range: 61 (80– 19)	
<b>Religion</b>	
Hindu	272(86.3)
Muslim	43(13.7)
Total	315(100%)
<b>Caste</b>	
Others	183(58.1)
SC/ST	51(16.2)
OBC	81(25.7)
Total	315(100%)
<b>Marital Status</b>	
Currently married	292(92.7)
Never married	9(2.9)
Widow	14(4.4)
Total	315(100%)
<b>Education ( Highest qualification achieved)</b>	
Illiterate	24(7.7)
Below primary(1-3)	71(22.5)
Primary(4-7)	104(33)
Middle(8-9)	80(25.4)
Secondary(10-11)	19(6)
Higher secondary	12(3.8)
Graduates and above	5(1.6)
Total	315(100%)
Mean: 5.59; SD: 3.41; Median:5.00; IQR: 3 – 8.00; Range: 15	
<b>Occupation</b>	
House wife	237(75.2)
Work for pay	47(14.9)
At home	31(9.9)
Total	315(100%)
<b>Type of family</b>	
Joint	249(79.0)
Nuclear	66(21)
Total	315(100%)
<b>Socio-economic status ( Modified B.G Prasad scale 2017)</b>	
Class I (≥ Rs. 6254)	2(0.6)
Class II (Rs. 3127 - 6253)	42(13.3)
Class III (Rs. 1876 -3126)	123(39.0)
Class IV (Rs. 938 - 1875)	132(41.9)
Class V (< Rs. 938)	16(5.2)
Total	315(100%)

<b>Hypercholesterolaemia</b>	Yes (61)	26(42.6)	1.52(0.826, 2.83)	0.17	-	-
	No (254)	50(19.7)	1			
<b>BMI</b>	>25 kg/m <sup>2</sup> (221)	58(26.2)	1.96(1.06, 2.89)	0.03	1.91(1.03, 2.67)	0.04
	<25kg/m <sup>2</sup> (94)	18(19.1)	1		1	
<b>Hypothyroidism</b>	Yes (82)	35(42.6)	2.10(1.21, 3.66)	0.008	1.96(1.02, 3.14)	0.02
	No (233)	41(17.6)	1		1	

Negelkerke R<sup>2</sup> = 0.351, Hosmer-Lemeshow = 0.671

**Inference: Table1** The mean age of the study participants was 44.19 years (SD :13.68 years) with minimum age of 18 years and maximum age of 78 years. Most of the study participants were in the age group of 34-49 years. Majority of them belonged to Hindu religion (86.3%) and most of them belonged to general caste (58.1%) followed by OBC (25.7%). Among all the participants 92.7% were currently married, 4.4% were widow, 2.9% were never married. Majority (88.6%) had education below secondary level with mean years of schooling 5.59 years (SD: 3.41 years) with median years of schooling 5 years (IQR: 3-8 years). Most of the study participants (75.2%) were homemakers. Majority (79.0%) were living in joint family. According modified B.G Prasad scale 2017 study participants were classified according to their per-capita income which shows 0.6 % belonged to upper class, 13.3% belonged to upper-middle class, 39.0% belonged to middle class, 41.9% belonged to lower middle class, 5.2% belong to lower class. Significant association was found between hypothyroidism and depression ( $\chi^2=6.07$ ,  $df=1$ ,  $p=0.014$ ).

**Table2:** The proportion of women suffering from Hypothyroidism and Depression were 82(26.0)

76(24.2) respectively and on bivariate analysis there was a significant association between these two variables.

**Table 3:** In univariate logistic regression depression was significantly associated with increasing age (OR=1.06(1.02, 1.07) with stress (OR=1.71(1.02, 2.88) with menopause (OR= 1.96(1.04, 2.98) but they lost their significance in multivariable binomial logistic regression. Multi variable logistic regression analysis reveals that depression is significantly associated with Hypothyroidism (AOR=1.96(1.02, 3.14) and also with Impaired glycaemic status (AOR=1.86(1.01, 2.78) and high BMI( >25 kg/m<sup>2</sup>) (AOR=1.91(1.03, 2.67). About 35% of the variance of depression can be explained by this model. Non-significant Hosmer-Lameshow(0.681) explained that model is fit.

## DISCUSSION

Significant association was found between depression and hypothyroidism ( $\chi^2=6.07$ ,  $df=1$ ,  $p=0.014$ ). A study conducted by Gold M.S et al revealed that a significant proportion of patients with depression may have early hypothyroidism. Because hypothyroidism can produce signs and symptoms of depression and can coexist as a second illness in depressed patients, patients with early hypothyroidism may be candidates for thyroid replacement therapy.<sup>[12]</sup>

Increasing age is significantly associated with depression in univariate regression (OR=1.06(1.02, 1.067) According to the study by Rodda J. depression is significantly associated with ageing, that is, depression is more common in older adults especially females.<sup>[13]</sup>

Impaired glycaemic status is significantly associated with depression in univariate and multivariable binomial logistic regression A study conducted by Badescu SV et al. reported that depression occurrence is two to three times higher in people with diabetes mellitus, the majority of the cases remaining under-diagnosed.<sup>[14]</sup>

High BMI (>25 kg/m<sup>2</sup>) is significantly associated with depression in this study. A study conducted by Leonore MW observed a significant U-shaped association between BMI categories (underweight, normal, overweight and obesity) and depression ( $p \leq 0.001$ ).<sup>[15]</sup>

Hypothyroidism which is considered to be the primary explanatory independent variable is significantly associated with depression in univariate and multi-variable binomial logistic regression (OR=2.10(1.21, 3.66) (AOR=1.96(1.02, 3.14)). This observation is in concordance with the result of a study conducted by Gold M.S et al where there was a significant proportion of patients with depression and anergia among those suffering from hypothyroidism.<sup>[11]</sup>

## Limitation

1. The study was cross-sectional in nature and hence temporal

association or cause effect relationship could not be established.

- Some responses were self-reported and recall based, hence answers might be biased due to recall problems or due to social-desirability bias.
- The study investigated depression among adult females, but investigation on males was left out in spite of the fact that depression can affect them also.
- The present study was done only in rural area, instead a comparative study between rural and urban could have elicited the effect of place of stay as determinant..
- In the present study history taking and examination were done only one time. One single investigator had to collect all the information by giving home visit in the study area. It took 12 months to cover all the required number of study subjects. As data collection period was 12 months covering all the seasons of the year, there might be some error due to seasonal variation of different morbidities
- Other plausible unknown confounders may have been missed out in the study.

## Strength

- The present study was a community based study on depression among adult females
- This study was intended to explore the prevalence of depression and its different determinants, both explanatory and contextual.
- The primary explanatory variable was hypothyroidism which was assessed at the community level.
- Sample size is quite sufficient since it has been calculated scientifically.. Therefore, the result obtained can be generalized to other similar settings.
- Multivariable logistic regression of various factors associated with depression was done. These findings will certainly help administration and policy makers to formulate a long waited public health initiative to deal with screening of both depression and hypothyroidism.

## Recommendation

- A large-scale multicentre research on depression and its risk factors like hypothyroidism at the community level across all parts of the country will give a clearer picture of the current scenario and also of all the causative risk factors that accelerate the occurrence of this morbidity.

## For policy makers/governments:

- It was observed in the present study that 24.1 % of the sample population was suffering from depression. This calls for an urgent massive public health initiative for its control and prevention.
- This is very unfortunate because most of these morbidities are preventable and treatable if detected on time. Therefore, there is need for mass campaign to increase the awareness of our community regarding depression and its consequences. With due consultation of field experts proper and appropriate Information, Education, and Communication (IEC) materials in local language should be developed and displayed with inclusion of pertinent and updated information regarding depression, hypothyroidism and their consequences.

## CONCLUSION

As depression is multifactorial, more studies analyzing these factors are required in future to understand the problem of depression better. However hypothyroidism which has been considered as the primary explanatory variable for the occurrence of depression has largely been neglected and stringent steps must be taken at all levels to overcome this public health problem.

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