Effect of lifestyle interventions to reduce depression, anxiety and stress among married women of reproductive age group: A non-randomised controlled trial in urban slums of Bhubaneswar

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Abstract:

BACKGROUND: Women are more prone to develop mental disorders as compared to men and the role of physical activities to reduce its burden by improving self-esteem is appreciable. This study aimed to evaluate the effect of lifestyle interventions to reduce depression, anxiety and stress among women in urban slums.

MATERIALS AND METHODS: This study was a non-randomized controlled trial carried out in two slums of Bhubaneswar in married women of reproductive age group (15 years-49 years) from June 2019 to September 2021 after approval from the institutional ethics committee. A total of 128 married women were recruited, 64 women in each arm. DASS-21 was used for assessing depression, anxiety, and stress of all participants. The lifestyle intervention program was provided to 64 women in the intervention group and educational materials were provided to the control arm. DASS score was assessed again and compared with follow-up scores in both groups. Descriptive statistics were expressed as frequency, mean, median, and standard deviations. Independent *t*-test and paired t-tests were done where applicable.

RESULTS: There was no significant difference in socio-demographic factors and DASS-21 scores in both groups during baseline. Depression, Anxiety, and stress score were significantly lower in the intervention arm than control arm in the follow-up ($P < 0.05$). There was a significant difference between the pre-intervention and post-intervention levels of depression, anxiety, and stress among the intervention group ($P = 0.05$).

CONCLUSIONS: Simple community-based physical activities as in our intervention program focusing on the reduction of depression, anxiety, and stress levels in women may prevent the rising problems of common mental disorders.

Keywords:
Anxiety, common mental disorders, depression, stress, women

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Introduction

Over the last few years, with the advancement of urbanization, residents have obtained a wide range of healthcare facilities.[1] However, this huge diversification has led to more people living in slums, especially near large cities. With the rapid progress of urbanization, living in slums has become a common problem in many disparate corners of the world, bringing many social repercussions

such as common mental disorders.[2] Common mental disorders (CMD) are a group of mental illnesses that include depression, anxiety, stress, and other related nonpsychotic affective disorders.[3] Globally, independent studies on depression have shown that women are twice as likely to suffer from depression as men.[4] The World Health Organization lists CMD as the main cause of disease burden for women aged 15–49 in India.[5] The prevalence of mental illness in India is estimated to be 58.2 per 1000 people.[6] Women constitute half of any society's population and play a variety of social and economic roles. Women's health is central to ensuring and maintaining family and community health.[7] Therefore, performing duties and responsibilities at home and the workplace are overwhelmingly married women in the workplace, which can lead to various psychological problems, such as role conflict, professional pressure, mental exhaustion, stress, anxiety, frustration, depression, anger, Social and emotional burdens. All these issues will have a synergetic adverse effect on the mental health of reproductive women, with a greater impact on married women. Again, the rapidly increasing depression, anxiety, and stress-like diseases are becoming the cause of women's suicide and ultimately endangering the entire community. Worldwide, women's suicide attempts are about three times higher than men.[8]

Previous research from India reported on the association between depression, anxiety, and stress and age, gender, income, legal status, education, poverty, and deprivation.[9] Additionally, the presence of chronic obstetric and gynecological comorbidities increases the risk of depression, anxiety, and stress.[10] Identifying the varied characteristics and mechanisms by which women can reduce the link between high perceived stress and depression is predicted to develop new strategies to promote mental well-being and improve the psychological state.

However, it's possible to stop the vulnerability of depression, anxiety, and stress from producing endorphins by changing various lifestyles, like exercise, yoga, and breathing techniques through pranayama, healthy eating, and innovative artistic activities (such as painting, dancing, singing, taking note of music, etc.) Many researchers have found regular participation in aerobic exercise has been proven as having anxiolytic effect which can help to decrease overall levels of tension, elevate and stabilize mood, improve sleep, and improve self-esteem.[11] Even five minutes of aerobic exercise can stimulate positiveness in the mind.[12]

Once again, theories about the role of diet in reducing depression, anxiety, and stress have been established.[13] Eating fresh vegetables, drinking plenty of water, getting enough calcium, and eating sweets such as tea, soda, and fruits will reduce the impact, and avoiding long-term caffeine intake can prevent the risk of depression, anxiety, and stress.[13] Avoiding alcohol has a huge impact on reducing the stress of mental illness, as many researchers in different geographic regions have found.[14] Exploring hidden talents such as dancing, singing, and painting has also played a vital role in reducing depression, anxiety, and stress.[15]

Therefore, the purpose of this study is to evaluate the effect of lifestyle interventions to reduce depression, anxiety, and stress among married women of reproductive age in the urban slums of Bhubaneswar.

Materials and Methods

Study design and setting
This study was a non-randomized controlled trial formulated in the department of Community Medicine, Institute of Medical Sciences and SUM Hospital, Siksha 'O' Anusandhan Deemed to be University and carried out in two slums of Bhubaneswar which were located within 15 km of the medical college and hospital which was conducted over two years three months from June 2019 to September 2021.

Study participants and sampling
All married women of the reproductive age group (15 years–49 years) who were giving consent for participation were included as the study population. Considering the time and feasibility of the study, it was decided to cover two slums; one is Saliasahi for the experiment group and another one is Sandhasahi for the control group. A convenient sampling method was adopted. Based on *a priori* two-tailed hypothesis, using parameters of 0.05 alpha, 95% confidence level, 0.75 moderate effect size, and 80% power with allocation ratio of 1:1, the sample size was calculated by using G* Power. The sample size calculated was 58. Considering the design effect of 2 and anticipating 10% loss to follow up total sample size inflated to 128 consisting of 64 women in each arm. Women with chronic, debilitating disease like cancer, stroke, those who are already diagnosed with schizophrenia, manic depressive psychosis, and those who are pregnant during our study were excluded from the study.

Data collection tool and technique
Data regarding the participant's socio-demographic profile, marital status, menstrual, and obstetric history, personal history, dietary habit, and addiction profile as well as environmental and housing condition were taken in the baseline survey. DASS-21 scale was validated in Odia language and used for assessing depression, anxiety and stress score of all participants.

A pre-designed, pre-tested interview schedule was used. It was pre-tested on 15 married women of the reproductive age group who came to Anganwadi center, Tapoban basti for VHND session to test the feasibility, reliability and validity of the questions while eliciting the required information. The tool was further modified and refined after pretesting. The questions that were not clear to the women were modified and any redundant items were deleted. The finalized tool was used for data collection. The study subjects were interviewed using a pre-designed, pre-tested, and semi-structured questionnaire. The prospect of the study for improvement of mental health among married women of reproductive age groups and reduction in depression, anxiety, and stress levels among them and complications of mental illness was explained to the participants.

In 1st phase of the study, baseline data of all women have been recorded. The collection of data was done in a friendly atmosphere after obtaining informed consent from participants and their family members. Some time was spent, at the beginning on informal discussions with the purpose of gaining the confidence of the women.

Adequate measures were taken to ensure objectivity in data collection. The data were checked for completion of the schedule. Privacy and confidentiality were maintained. It took about 20 minutes to complete the data collection and assessment of each participant. In a day a maximum of 8 participants were interviewed. Urban slum visits were done 2 days a week as per convenience of the study participants. It took around 2 months to collect baseline data from both experimental and control group women.

Control group women were given printed educational materials in the form of a carefully prepared poster. The intervention group was intervened with an integrated educational package about the concept of mental health, mental illness using poster, role of healthy diet to reduce common mental illness using audio-visual presentations, with a practical demonstration of Yoga, Exercises including Aerobic Exercises and Pranayama.

To improve the knowledge, attitude, and behavior of married women toward the prevention of depression, anxiety, and stress, an integrated educational package was prepared. The package included materials on lifestyle modification for depression, anxiety and stress management, and a healthy diet. The intervention package is tabulated in Table 1.

The total 64 participants of the intervention group were divided into 3 groups each consisting of 20 to 22 women. Each group was intervened with 4 sessions, each session of 4 consecutive days including one

Table 1: Intervention Tool

Slums	No. of Samples	Group	No. of days	Duration of Intervention 1 months + follow up (6 months)
Saliasahi	64	16	Day 1	Session-1:
			Day 2	Concept of mental Health,
			Day 3	Definition of Depression,
			Day 4	anxiety and stress, Video clips
		16	Day 5	on mental illness among women
			Day 6	
			Day 7	Session-2:
			Day 8	Role of Exercise in mental health,
		16	Day 9	Demonstration of Brisk walking,
			Day 10	Aerobic exercise, promoting
			Day 11	activities like cycling, dancing
			Day 12	
		16	Day 13	Session-3:
			Day 14	Demonstration on Yoga,
			Day 15	pranayama like Surya namaskar,
			Day 16	Bhujangasana, padmasana, Motivation to involve in social work, painting, singing etc.
				Session-4: Nutritional education and counselling on avoiding alcohol intake and other addiction
Sandha sahi	64	32	Day 17	Handout of educational materials circulated among control participants
		32	Day 18	-Do-

interactive audio-visual session of 40 minutes. During all the sessions Covid-19 protocol was maintained. Each participant was provided with a mask and hand sanitizer. Social distance was maintained among all participants. After a gap of 1 month, each woman was reinforced by the investigator on weekly basis through the telephonic method. The telephonic approach was done 3 days per week for at least 10 minutes, and they were motivated to do physical exercises every day. They were encouraged to follow the instructions to maintain a healthy lifestyle. On completion of the intervention, data were collected to assess the changes in total score of depression, anxiety, and stress by DASS-21 scale. The data collected were analyzed by SPSS software [Figure 1]. Descriptive statistics were expressed as frequencies (percentages), means, median, and standard deviations. Independent *t*-test and paired *t*-test was done. *P* value of 0.05 or less was considered as statistically significant.

Ethical consideration

Before starting work, this dissertation was approved by the Ethics Committee of IMS and SUM Hospital; Bhubaneswar; Siksha 'O' Anusandhan deemed to be University with the code of ethics DMRI/IMS.SH/SOA/180328.

Flow diagram of participant enrolment in the study

Results

This study was carried out to evaluate the effect of Lifestyle interventions to reduce depression, anxiety, and stress among married women of reproductive age group i.e., 15–49 years in two selected urban slums under the Urban Health and Training Centre attached to the Department of Community Medicine at IMS and SUM Hospital, Bhubaneswar.

The socio-demographic data of both the control and intervention groups during baseline were depicted in Table 2. The majority of the head of families in both slums are working in the shops. The socioeconomic scale was calculated in both groups by using the Modified Kuppuswamy scale 2020. The majority of participants belong to lower middle socio-economic status (48.40%, 47%) followed by upper lower (35.90%, 34%) and lower SES in both groups. There was no difference in socio-economic status between the control and intervention groups. The mean age of menarche among the participants in the control group was 13.73 years + 1.99 years and ranging from 12–18 years and the mean age of menarche among intervention group participants was 14.03 + 2.03 years.

A total of 51% of women in the control group and 49% of women in the intervention group had a regular cycle of menstruation each month. Though most of the women reported normal menstrual blood flow during their cycle around 17.18% of women in the control group and 10.93% of women in the intervention group had suffered from menorrhagia and 6.25% of women in the control group and 9.3% women in the intervention group were reported with hypomenorrhea. Most of the participants had one or two children in both the control and experiment groups. In the control group, 40.62% of women had bad obstetric history like stillbirth, miscarriage, abortion, and infertility while 35.93% of women in the intervention group had such type of bad obstetric history. Among all participants, 16.40% of women had a history of complications like sepsis or post-partum hemorrhage during their childbirth period. In our study, 20.83% of women in the control group and 18.33% of women in the intervention group have a history of complications during their childbirth. Again, among the control participants who had complications, 8.33% of women had sepsis and 12.5% of women had PPH. Among the intervention group participants, 11.66% of women had history of sepsis, and 6.66% of women had PPH. The mean score of the 3 domains of DASS-21 scale was assessed in both groups and compared in Table 3. The prevalence of depression, anxiety, and stress was
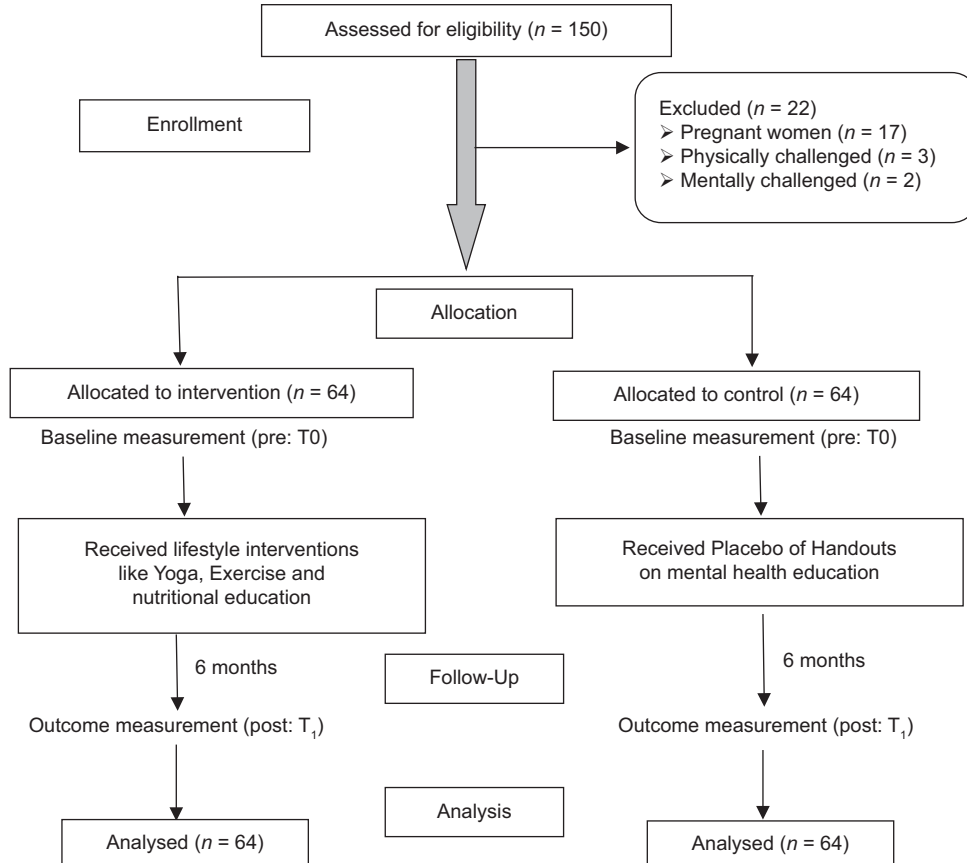

Figure 1: Flow diagram of participant enrolment in the study

Table 2: Socio-demographic profile

Characteristics	Classification	Overall Mean±SD or Number (%)	Control (*n*=64) Mean±SD or Number (%)	Intervention (*n*=64) Mean±SD or Number (%)	P
Age (years) of Participants		31.99±7.50	31.86±7.33	32.13±7.72	0.6
Religion	Hindu	112 (87.50%)	57 (89.06%)	55 (85.93%)	0.62
	Muslim	3 (2.34%)	1 (1.56%)	2 (3.12%)	
	Christian	13 (10.15%)	6 (9.37%)	7 (10.93%)	
Caste	General	79 (61.71%)	38 (59.37%)	41 (64.06%)	0.44
	SC/ST	25 (19.53%)	15 (23.43%)	10 (15.62%)	
	OBC	26 (20.31%)	11 (17.18%)	15 (20.31%)	
Family	Nuclear	57 (44.53%)	28 (47%)	29 (47%)	0.91
	Joint	60 (46.87%)	30 (47%)	30 (51%)	
	Broken	11 (8.59%)	6 (6%)	5 (2%)	
Age of Husband		39.37±7.93	39.14±7.93	39.59±7.98	0.55
Mean age of Marriage		17.76±3.73	17.66±3.99	17.91±3.48	0.52
Duration of Marriage		14.30±8.52	14.69±8.66	13.92±8.43	0.73
Age of participant at the time of marriage	18 years and above	86 (67.2%)	40 (62.5%)	46 (71.9%)	0.25
	Below 18 years	42 (32.8%)	24 (37.5%)	18 (28.1%)	
Marital status	Living with spouse	123 (96.1%)	60 (93.8%)	63 (98.4%)	0.38
	Separated/ divorcee/widow	5 (3.90%)	4 (6.25%)	1 (1.6%)	
Education	Illiterate	6 (4.68%)	3 (4.7%)	3 (4.7%)	0.9
	primary school	53 (41.4%)	28 (43.8%)	25 (39.1%)	
	middle school	29 (22.65%)	13 (20.3%)	16 (25.0%)	
	High-school	26 (20.31%)	14 (21.9%)	12 (18.8%)	
	Graduate	14 (10.93%)	6 (9.4%)	8 (12.5%)	
Occupation	Homemaker	90 (70.31%)	45 (70.3%)	45 (70.3%)	0.9
	Elementary	18 (14.06%)	10 (15.6%)	8 (12.5%)	
	Craft and related	14 (10.93%)	6 (9.4%)	8 (12.5%)	
	Skilled workers	6 (4.68%)	3 (4.7%)	3 (4.7%)	

*Independent *t*-test *Chi-square test

Table 3: Mean DASS score in control and intervention group at baseline and after intervention (*n*=128)

	Baseline			Follow up		
	Control Mean±SD	Intervention Mean±SD	P	Control Mean±SD	Intervention Mean±SD	P
Depression	13.56±5.59	12.53±5.55	0.978	13.56±5.44	7.40±3.10	*0.000
Anxiety	10.56±2.81	10.09±2.06	0.036	10.43±2.97	6.34±1.90	*0.005
Stress	13.12±4.33	14.34±4.00	0.316	12.90±4.26	9.06±2.22	*0.000

*Independent *t*-test

Table 4: Prevalence of Depression, Anxiety and Stress Depression, Anxiety and Stress among participants at baseline and follow-up period (*n*=128)

	Control			Intervention		
	Baseline Number (%)	Follow up Number (%)	P	Baseline Number (%)	Follow up Number (%)	P
Depression	53 (82.81%)	53 (82.81%)	0.50	48 (75%)	15 (23.43%)	0.00
Anxiety	61 (95.31%)	60 (93.75%)	1.00	64 (100%)	25 (39.06%)	0.00
Stress	22 (34.37%)	21 (32.81%)	1.00	28 (43.75%)	1 (1.56%)	0.000

*McNemar's test

found very high and approximately similar in both groups [Table 4].

The mean DASS-21 score between the two groups was compared based on the participant's socio-demographic profile, occupational status, personal habit, in-law's torture, and alcohol consumption habit of husband [Table 5]. There was a significant reduction in the mean score of depression, anxiety, and stress among experiment participants after six-month completion of the intervention process [Table 6]. The severity of depression, anxiety, and stress in each group before and after the intervention is analyzed in Figure 2.

Table 5: Mean DASS score comparison of all participants on the basis of sociodemographic and personal variables (*n*=128)

Variables	Sub-group under each variable		Depression Mean±SD	Anxiety Mean±SD	Stress Mean±SD
Educational status	Illiterate		15±8.46	9.79±2.28	12.66±3.50
	Literate		12.48±5.08	9.66±1.96	12.57±2.65
		P	0.33	0.38	0.76
Occupational status	Working		12.97±5.05	9.68±2.10	12.68±4.56
	Non-working		13.36±6.74	10.60±2.56	14.17±3.98
		P	0.09	0.36	0.27
Marriage event	With parent's permission		13.55±5.63	10.55±2.59	13.83±4.00
	Without permission		11.60±5.23	9.60±1.84	13.40±4.84
		P	0.09	0.16	0.46
Menstrual cycle	Regular		13.05±5.71	10.31±2.44	13.61±4.25
	Irregular		13.75±3.10	10.50±2.97	15.50±2.97
		P	0.84	0.41	0.13
Relation with in- laws'	Satisfied		12.85±3.39	9.85±2.41	14.57±3.08
	Bad		13.05±5.57	10.45±2.53	13.70±4.26
		P	0.71	0.64	0.08
Dowry demands	Yes		13.30±5.47	10.69±2.66	13.97±4.37
	No		12.76±5.78	9.88±2.19	13.36±3.92
		P	0.67	0.81	0.42
Bad obstetric history	Yes		13.33±7.19	10.46±2.52	13.90±3.94
	No		13.03±5.18	9.75±2.15	13.00±5.20
		P	0.01*	0.04*	0.03*
Past trauma history	Yes		13.39±6.53	12.87±6.40	13.33±61
	No		12.92±5.01	12.93±5.76	13.98±5.80
		P	0.58	0.07	0.44
Child abuse history	Yes		16.66±9.26	10.39±2.48	13.80±4.23
	No		12.91±5.33	9.00±1.67	12.33±3.44
		P	0.01*	0.6	0.30
In-law's torture	Yes		13.13±5.24	10.44±2.52	13.96±3.86
	No		12.91±7.00	9.83±2.20	12.75±5.43
		P	0.02*	0.62	0.006*
Alcohol consumption by husband	Yes		13.24±6.16	10.57±2.61	13.84±4.67
	No		12.73±3.92	9.73±1.98	13.47±2.81
		P	0.005*	0.04*	0.002*
Daily exercise habit	Yes		13.00±5.34	9.00±1.34	12.50±3.72
	No		14.00±7.76	10.46±2.52	13.86±4.24
		P	0.30	0.04*	0.75

*P<0.05=significant difference in mean score

Table 6: Effect of Lifestyle interventions among all participants (*n*=128)

| Group categories	DAS score	Baseline M±SD	Follow-up M±SD	Difference in score M±SD (CI)	P
Control group	Depression score	13.56±5.59	13.56±5.44	0.09±0.75 (-0.09-0.28)	0.321
	Anxiety score	10.56±2.81	10.43±2.97	0.12±1.00 (-0.12-0.37)	0.321
	Stress score	13.12±4.33	12.90±4.26	0.21±1.07 (-0.05-0.48)	0.109
Intervention group	Depression score	12.53±5.55	7.40±3.10	5.12±3.06 (4.35-5.89)	0.000
	Anxiety score	10.09±2.06	6.34±1.90	3.75±1.20 (3.44-4.05)	0.000
	Stress score	14.34±4.00	9.06±2.22	5.28±2.69 (4.60-5.95)	0.000

*Paired *t* test
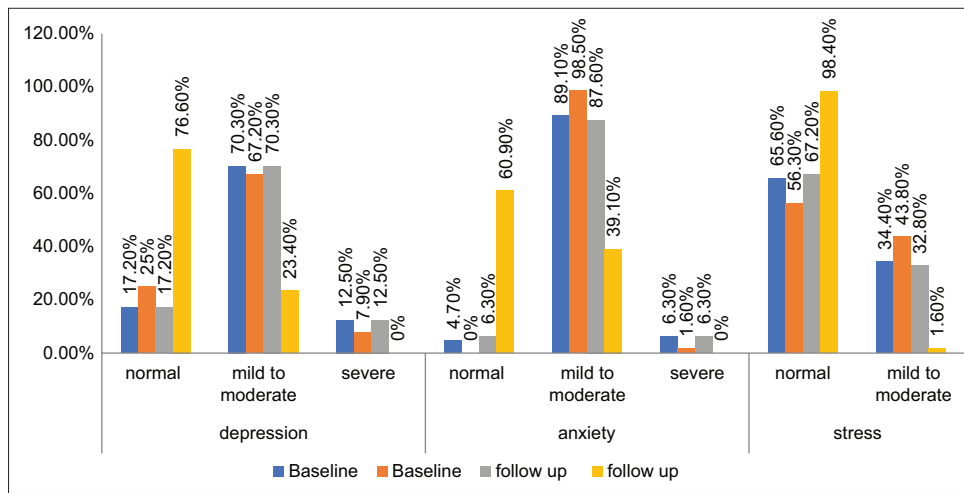
Figure 2: Comparison between severity score of DASS among participants before and after intervention (*n* = 128)
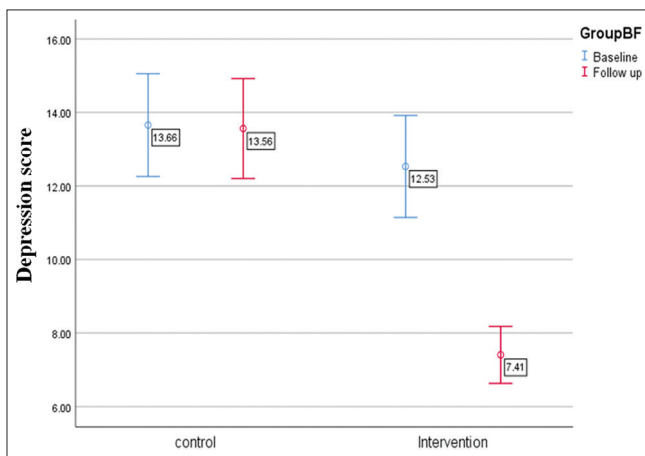

Figure 3: Changes in mean depression score in baseline and follow up period

The significant reduction in the mean score of depression, anxiety, and stress among the intervention group was plotted in Figures 3-5 respectively.

Comparing the mean score of depression, anxiety, and stress before and after intervention showed that, there was significant reduction in DASS score in the intervention group [Figures 3-5]. But there was no significant change in DASS score in the control group.

Discussion

Recent studies have shown the growing prevalence of common mental disorders and women are the most vulnerable group to develop mental disorders. Earlier studies have emphasized the need for evaluating factors like poverty and its indicators and cultural variations in the expression of distress and therefore such studies are needed in the local/regional context. Limited interventional studies have been done previously for assessing the effect of yoga or exercise and some have focused on the dietary role in reducing depression, anxiety, and stress level among different age group

populations. This study was done to evaluate the effect of lifestyle interventions to reduce depression, anxiety, and stress among married women of the reproductive age group in the urban slums of Bhubaneswar.

This study compared stress, anxiety, and depression of married women belonging to the reproductive age group i.e., 15–49 years of both control slum and experimental slum. There is very higher proportion of women reported with feeling depression (78.90%), anxiety (97.65%), and stress (39.06%) in our study which is nearly consistent with another study by Kumar *et al*. They reported a higher proportion (48%) of slum women aged 15-49 years having poor mental health. Whereas a study conducted by Panigrahi A *et al*. and Zeynep *et al*. revealed that, more than 20% of married slum women had a common mental disorder.[16,17]

The proportion of common mental disorders especially depression, anxiety, and stress among the reproductive age group of women in urban slums were found to be 82.81%, 95.31%, and 34.37% respectively in the control group and around 75% depression, 100% anxiety and 43.75% stress found among the women of the intervention group. The proportion of common mental disorders found in our study was higher compared to other studies done in India. The evidence for a higher proportion of common mental disorders in women has been unquestionable and has been reported across time, cultures, and countries. Studies have cited the social, economic, and biological factors for the same. Considering the trend of increasing prevalence in common mental disorders, the proportion obtained from this study seems to be reflecting the trend studied and inferred in prevalence obtained from the previous studies.[18-20]

For all married women, educational status, occupational status, dowry demands during the marriage, relationship with in-laws, spousal alcohol habit, and their lack of
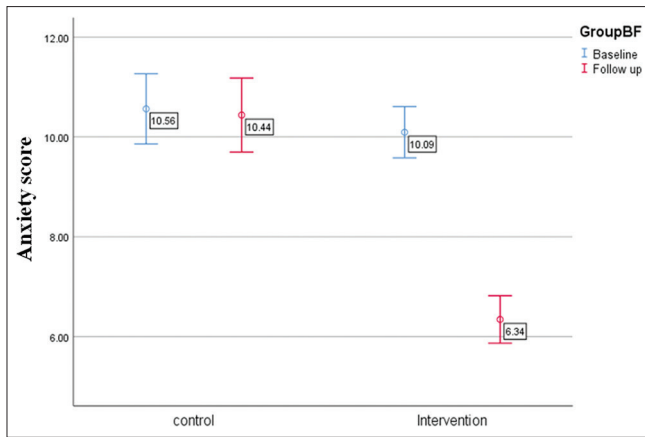
Figure 4: Changes in mean anxiety score in baseline and follow up period
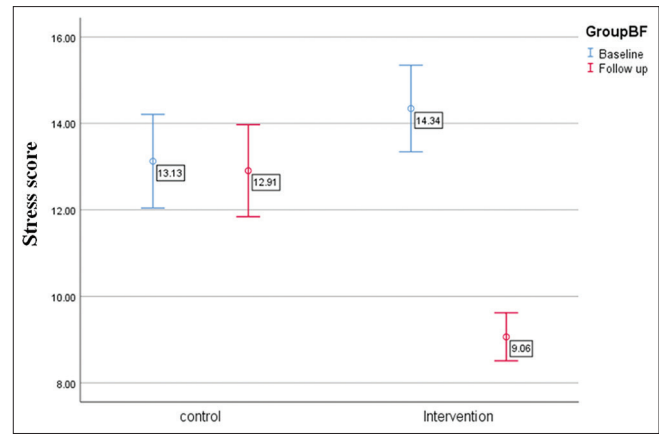

Figure 5: Changes in mean stress score in baseline and follow up period

daily exercise was positively associated with anxiety, stress, and depression. The results also indicated that the women having past trauma history, and abuse history were at higher risk of anxiety, stress, and depression than the women having no similar history after demographic variables had been considered. In our study, the majority (90%) of women having common mental disorders were not aware of depression, anxiety, and stress and also the severity of subsequent episodes of CMDs. They never consulted any health care provider regarding their mental health problems, which might be due to low educational status, lack of awareness regarding mental health services available in the city, the social stigma associated with mental disorders, or the inability to pay for such services. This highlights the urgent need to address the mental health needs of slum women. The association of low educational status with increased odds of having a mental disorder among married slum women has been well documented (Almeida *et al*., Kumar *et al*., Poongothai *et al*., Shidhaye and Patel *et al*.).[21-25] Being illiterate also was seen as associated with common mental disorders (*P* value = 0.002, OR 0.25) by Panigrahi A *et al*.[16] Indicators of poverty, literacy and common mental disorders is widely reported.Click or tap here to enter text. Women engaged in work outside the home had lesser score of depression, anxiety and stress than housewives, which might be due to engagement in works reflects as positive coping methods for reducing personal and familial worries. Similar result found in a systematic review, Mirza and Jenkins revealed a positive association between 'being a housewife' and mental disorders.[26] However, previous study in Odisha showed higher odds of mental illness among working women as compare to home maker.[16] Still, many of the women who were employed or had an income also reported issues of irregular employment, difference in wage from their spouse. They expressed that they were uncertain about the next day of employment. This raises the question of whether employment in women actually translated into financial security or financial independence in the marginalized group. This could be the reason for occupation or being gainfully employed is not seen to be a protective factor against common mental disorders. Family income was also not found to be associated with common mental disorders. Studies conducted by Freeman *et al*., Christopher G *et al*., and Joanna M *et al*. reported with the role of socio-economic status as a risk factor for depression, anxiety, and stress. All these studies depicted lower socio-economic status associated to more risk of depression, anxiety, and stress (*P* < 0.001).[27-29] Around 45.31% of participants lived in a nuclear family setting. The mean score of depression, anxiety, and stress was higher in the nuclear family as compared to the joint family, but no significant association was found in our study. This might be due to lack of social support, protection during crises, financial instability, dependence on a single family member for family income, women unable to pursue vocation due to child rearing, lack of a confidant, lack of social support, etc., in a nuclear family. Being in a nuclear family as compared to a joint family (*P* = 0.008) was found to be significantly associated with common mental illness by Panigrahi *et al*. and Lodhi *et al*.[16,30]

Early marriage, i.e., marriage before 18 years, showed a significant association with depression among married slum women in our study. This might be due to psychological immaturity and less coping capacity with the extra burdens of familial and social responsibilities when women get married at a younger age. Panigrahi A *et al*. and Le Strat *et al*. observed that the common mental disorders were higher for women who married before the age of 18 years. A similar result was also found in another study (Takagi *et al*.).[16,31,32] In the present study, women who got married without their parent's permission live happily with their husband. It might be due to good adjustment in their marital life and husband's co-operation towards household activities. Bushra Rauf *et al*. agreed with the statement that forced marriage by parents lead to higher mental illness among women.[33]

In our study, marital status was not associated with mental health status, as there were very few women reported as widowed or living separated from their spouse in the selected slums. However, the odds ratio for the marital status of being widowed or separated was 5.24 (*P* value = 0.015) in a previous study conducted in Odisha by Panigrahi A *et al.*[16] In our study, frequent misunderstandings or quarrels with the husband or in laws' family members were strongly associated with higher odds of having a mental disorder among slum women, which has been widely reported previously (Panigrahi A *et al.*, Mirza and Jenkins, Kumar *et al.*, Shidhaye and Patel *et al.*).[16,21-23,26] This specifies the importance of maintaining a harmonious relationship in the family in promoting mental health among slum women. This association found in univariate and substantiated by a high odds ratio in multivariate was not surprising in view of the patriarchal nature of society, the commonly prevalent system of dowry, added expenses borne solely by the bride's family for a wedding, pattern of borrowing money for the same and often women being unemployed or not having autonomy over their earnings. The reason for this association, therefore, seems to be multidimensional involving domains of economic liabilities, and gender disadvantage prevalent in terms of education and occupation.

In the domains of physical health including obstetric and gynecological factors, having abnormal menstrual history and complications during childbirth, history of abortion, miscarriage, infertility, and stillbirth were seen to be associated with depression, anxiety, and stress. The factors of physical health including obstetric and gynecological factors have been studied and found to be associated which is keeping in with the findings of the study. It can also be due to a common mental disorder causing poor control of physical symptoms, causing learned helplessness, causing excessive concern, and therefore, causing over-reporting of physical symptoms and concerns. Though a number of children more than two was not found to be significantly associated with common mental disorders, a disheartening finding was bad obstetric history such as events of stillbirth, miscarriage, abortion, and infertility significantly associated with depression (*P* = 0.01), anxiety (*P* = 0.04) and stress (*P* = 0.03).

The mean score of depression, anxiety, and stress was found to be more in women who had past trauma history and childhood abuse history as compared to those who didn't have such history (*P* = 0.01). The results were congruent with the findings of Springer KW *et al.* and Negele A *et al.*[34,35] Women living with husbands or family members who were addicted to alcohol or drugs had nearly twice the odds of having mental illness. Women whose husbands were alcoholic were found to be significantly higher depression score (*P* = 0.005), anxiety score (*P* = 0.04) and stress score (*P* = 0.002) than their counterparts who did not live with husbands or family members who had such addictions. This is in congruence with findings from various studies (Panigrahi A *et al.*, Kumar *et al.*, Shidhaye *et al.* and Patel *et al.*).[16,21-23] A study by Owan VJ *et al.*[36] reported alcohol intake is accountable for 79.7% of the mental stress of graduates. Patel *et al.*[22] showed that mental disorders were more frequent among women who experienced difficulty in managing financially, which is similar to our result. Other studies on spouses of alcoholics show that they are studied to be subjected to increased rates of domestic violence in the form of physical, verbal, and sexual violence, economic burden, poor social support, low marital satisfaction, and maladaptive coping skills. Based on this study on CMD we propose a strong correlation between common mental disorders in women and alcohol-dependent syndrome in spouse.

Spending time for daily exercise was also positively associated with good mental health in slum women. Overall, our findings suggest that the depression score in personnel with high physical activity is lower than those with low levels of physical activity. A study conducted by the level of depression in those with high and moderate physical activity was significantly lower than in those with low physical activity. Involvement in extra-curricular activities was also positively linked with mental well-being. Takagi *et al.* revealed that social participation had a protective effect on women's depressive symptoms.[32] This indicates that slum women might be protected against mental disorders by keeping themselves engaged in social activities. We also observed that frequently attending religious services and spending time for recreation with family was positively related to mental health. Various studies (pressman S *et al.*, Qian *et al.* and Goodman WK *et al.*) have also shown that religious activities, and spending time for recreation is linked with favorable mental health and fewer symptoms of distress and depression.[37-39]

After providing the Lifestyle interventions in this study, there is a significant improvement in depression, anxiety, and stress levels of the intervention group improved in comparison with the control group. This is consistent with previous research that provided exercises, yoga, and meditation for reducing depression and anxiety and got the positive result[40-42] Another study conducted by Ulla Díez SM *et al.* provided a health-promotion intervention to college students and found that among the subdomain of health-promotion behavior, nutrition was found to be most effective (*P* = 0.0001).[43] A study by implementing educational interventions including nutrition and exercise significantly reduce mental illness (*P* < 0.05) among middle-aged women.[44] Another study by

Zhang J *et al.* showed the effects on mild depression among women with regular exercise are particularly notable, at 10.22 percent higher among those unable to work and 7.17 percent higher among the unemployed, compared to their homemaking counterparts.[45] After our Lifestyle intervention, the study group showed a significant decrease in depression score ($P = 0.00$), anxiety score ($P = 0.005$), and stress score ($P = 0.000$) as compared to the control group. This is consistent with a systematic review and meta-analysis on Lifestyle interventions provided to women of reproductive age, with depression declining by 1.35 times and anxiety by 1.74 times.[46] Similar findings were also reported by Nho *et al.* by giving lifestyle interventions to female college students.[47]

A review by Rooney *et al.*[48] analyzed the role of fruits and vegetables in the broad aspects of psychological well-being, but it was not a systematic review and the authors emphasized the need for a more exhaustive synthesis of studies in the form of a systematic review. There are specific nutrients, which are known as such that may be related to mental health and for which fruit and vegetables are indicated as a valuable source in diet, such as complex carbohydrates and fiber, being associated with the glycaemic index, vitamin C, vitamin B, carotenoids, potassium, and polyphenols.[48-50]

Limitations and Recommendations

Need-based intervention will be effective if practiced for a longer duration. Relied upon self-reports of co-morbidity and did not assess the severity of the disease. Information bias during baseline data such as menstrual profile, obstetric profile, and addiction profile in their home. Recall bias during eliciting past trauma, child abuse history, and 24-hour diet history. The Intervention phase was during the Covid-19 pandemic. This might have added the extra burden of depression, anxiety, and stress among the women. Again, the disease threat might have made the regular walkers also remain indoors.

Considering the high prevalence of depression, anxiety, and stress among women, the feasibility of screening programs needs to be studied. The factors causing mental upset, physical inactivity, and unhealthy diet can be systematically modified and lifestyle modification needs to be reinforced and made a way of life. Undertaking group-based physical activity/exercises are important and can be facilitated through community, friendship, or family networks. Role models who have benefitted from the intervention, may also prove particularly helpful to encourage more people.

Conclusion

Since minor mental illness among married women of reproductive age group in urban slums was found to be significantly high, simple community-based lifestyle modification activities as in our intervention program focusing on the reduction of depression, anxiety, and stress level of women will prevent the rising problems of common mental disorder. Lifestyle interventions like physical activity (brisk walking and aerobic exercises), yoga, pranayama, meditation, healthy dietary habit adoption, and involvement in extra-curricular activities like singing, dancing, cycling, and painting not only improves the mental health status but also accelerate their physical fitness. Such programs and activities as routine to be encouraged at the community level exclusively for women of this group during other reproductive health service delivery will certainly help to tackle the problem. Undertaking group-based physical activity/exercises are important and can be facilitated through community, friendship, or family networks. Role models who have benefitted from the intervention, may also prove particularly helpful to encourage more people.

Conflicts of interest
There are no conflicts of interest.

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