

Prevalence of Depression and Associated Factors Among Normal and Overweight Reproductive Age Women, Ethiopia: Community-Based Comparative Cross-Sectional Study

This article was published in the following Dove Press journal:
International Journal of Women's Health

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Background: Depression and overweight are serious public health problems and the most common complications of childbearing age with many negative consequences on the mental health of women and their children in the world. Even though both have a serious impact, no study has been done in Ethiopia. Therefore, this study aimed to assess and compare the prevalence of depression and associated factors among normal and overweight reproductive-age women in Debre Berhan town.

Methods: A community-based comparative cross-sectional study was conducted from April–June 2020. Patient health questionnaire-9 was used to measure the level of depression and list of threatening experience for stressful life events. Body mass index values of 18.5–24.9 and 25–29.9 kg/m² were used to classify as normal, and overweight, respectively. The data were entered into Epi Data V. 4.6 and were analyzed using SPSS V. 25. A statistically significant association was declared at a p-value < 0.05.

Results: From 1530 participants the response rate were 96.1% and 100% for normal and overweight women, respectively. The prevalence of depression among normal weight women was 26.02% (95% CI: 23.3%, 28.73%) whereas among overweight was 32.89% (95% CI: 28.85%, 36.93%). For women who have normal weight; being exposed to stressful life events, having poor social support, and body image disturbance were statistically significant factors. For women who have overweight, stressful life events, body image disturbance, and experienced weight stigma were significantly associated.

Conclusion and Recommendation: Depression among overweight women was high compared to normal weight in Debre Berhan town. Promoting social support at any aspect of health care services are very important to minimize depression. Especially for overweight women, encouraging management of medical illness, coping mechanisms for different stressful life events and potentiating self-confidence towards body image are a vital means to prevent depression. Health promotion program targeting reproductive age women with significant associated factors are important to overcome overweight and depression in Debre Berhan town.

Keywords: depression, normal weight, overweight, reproductive-age, women

Background

Depression is characterized as the presence of symptoms like depressed mood, loss of interest, change in appetite and sleep pattern, psychomotor agitation and retardation, lack of energy, feelings of guilt, problems of thinking and making decisions, and recurring thoughts of death or suicide.¹

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Maternal depression is a serious and common illness that can affect a woman's emotional health and compromise their quality of life and daily function. The magnitude and impact of maternal depression is a serious public health problem and burning issue especially in low- and middle-income countries. The maternal mental health problem is not well-given attention and emphasizes like that of physical health.^{2,3}

Overweight and depression are the most escalated and serious public health problems in the world. Both cause a serious immediate and long-term public health problem that leads to high maternal morbidity and mortality, enormously affecting the family and society. Besides, overweight and depression have a bidirectional association, overweight is one of the strongest risks for the occurrence of depression.⁴⁻⁷ Being overweight negatively influences depression treatment outcomes as compared to normal weight.⁸ Ethiopian Demographic Health Survey (EDHS) had reported the number of overweight women was 12.1% and normal-weight women were 65.2% in urban Ethiopia.⁹

Even though the etiological aspect of depression among overweight women is numerous and complex many scholars briefly express that factors like chronic medical illness, poor social support, body-weight stigma, body image disturbance, young age, marital problems, unemployment, low income, low educational level, low physical activity, marital status, co-morbidities, smoking, and alcohol drinking are involved as risk factors.¹⁰⁻¹⁷ On the other hand, overweight is associated with depression due to neuro-endocrine disturbances, Hypothalamus-pituitary-adrenal (HPA) axis deregulation, and inflammation of the brain. Cortisol, in the presence of insulin, inhibits lipid-mobilizing enzymes, a process mediated by glucocorticoid receptors.⁵ Nowadays, weight-related stigma among reproductive-age women has been increasing throughout the world, and it is highly associated with depression.¹⁸ Having normal weight improves maternal emotional health by decreasing their shame, stigma, and negative self-concept associated with overweight.¹⁹

Overweight accelerate the prevalence of depression by 20%, and the level of body mass index (BMI) has a directly incremental association with depression.⁵

Many studies across the world report on depression with a wide range of prevalence among overweight reproductive-age women. Studies across the world revealed that the prevalence of depression among normal weight reproductive age women ranges from 5.8% to 29%.^{10-15,20-22}

whereas among overweight reproductive age range from 5.9% to 38%.^{10-15,20-23}

Despite depression and overweight have many negative consequences on the mental health of reproductive-age women; no information on the degree to which normal and overweight women experienced depression, and its associated factors in Ethiopia. Therefore, this study aimed to assess and compare the prevalence of depression and associated factors among normal and overweight reproductive-age women in Debre Berhan town, Ethiopia. It will be vital for Debre Berhan town health department to address maternal mental health issues. Besides, it will be an input for policymakers and planners to indicate appropriate measure to tackle the problem regarding depression among overweight women in the community.

Methods

Study Design and Study Period

Community based comparative cross-sectional study design was employed from April – June 2020.

Study Area

The study was conducted at Debre Berhan town, which is found in North Shoa Administrative Zone, Amhara National Regional State, Ethiopia. Based on the 2007 Ethiopian central statistical agency report there are 23,093 are reproductive-age women in Debre Berhan.²⁴ In the town, there is one public referral hospital and one private general hospital, 3 health centers, 9 health posts, 5 private specialty clinics, which render health services for the community and only the referral hospital deliver psychiatric service as outpatient level.

Source Population

All women of the reproductive age group who are residing in Debre Berhan town (at least six months) were the source population.

Study Population

This study was conducted on randomly selected reproductive age women who have normal weight and overweight in Debre Berhan town. Women who reside less than six months and avail at the study area during the time of data collection and who were unable to communicate, pregnancy with 2nd and 3rd-trimester gestational period, edematous at the time of measuring weight and spinal

problems (kyphosis, lordosis, and scoliosis) were excluded.

Sample Size Determination and Sampling Technique

The sample size of the study was computed by using Epi Info version 7 by considering the following assumptions: 95% confidence interval, power 80%, normal weight to an overweight ratio of 0.5, and the prevalence of depression among normal weight ($P1 = 13.3\%$), and $p1 =$ the prevalence of depression among overweight ($P2 = 18.9\%$).¹¹ Therefore, the total sample size becomes $N=1569$ (normal-weight women = 1046, and overweight women = 523).

Initially, out of nine administrative kebeles (the smallest administrative governmental structure), three kebeles were selected. Then, a preliminary survey was done to get the list of normal and overweight women households in each selected Kebeles and used as a sampling frame. A simple random sampling technique was used to get both normal and overweight women from each kebeles by using computer-generated random numbers. When more than one eligible woman is found in the selected households, the lottery method was used to select one eligible woman.

Data Collection Tools and Procedures

An interviewer-administered questionnaire was employed to collect the data, which was prepared in the local language (Amharic). Five data collectors (BSc Nurses) and one supervisor were used and training is given for two-day on the data collection tool and content.

Depression was assessed by using PHQ-9 and the study participants were considered to have depression if their PHQ-9 score was ≥ 5 .²⁵ Body mass index was calculated by dividing the body weight by height in meters squared (kg/m^2). BMI values of 18.5–24.9 and 25–29.9 kg/m^2 were used to classify as normal, and overweight, respectively.²⁶ The weight was measured with the participants in a standing position without shoes and with light clothing using a beam balance to the nearest 10 g. Similarly, the height was measured to the nearest 0.1 cm with the participants in an upright position with the face look straight forward. Physical activity (PA) assessed the frequency and duration of the activity and categorized as mild (walking for recreation or transport), moderate (volleyball, shooting baskets or vigorous physical activity at least 20min once or twice/week), and severe (vigorous

(running or jogging, road biking and swimming laps or physical activity at least 20 min \geq three/week) activity in the last week.²⁷ Total metabolic equivalent (MET) minutes/week were calculated as walking minutes $\times 3.5$ + moderate minutes $\times 4$ + vigorous minutes $\times 7.5$, and PA was categorized as none (0 to <40 MET minutes); very low (40 to <300); low (300 to <600); moderate (600 to <1200); or high (≥ 1200).¹³ Weight-based stigmatization was measured with a modified version of the Stigmatizing Situations Inventory (SSI). The tool had ten items measure on six points Likert scale ranging from zero (never) to five (daily) that experienced stigmatizing situations within the past month. The internal consistency indicates sufficiently reliable (ie, an overall α of 0.92).^{28,29} A body image disturbance (BID) was assessed by using a single item and the response score ranged from 0 (always) to 5 (never).¹⁷ The stressful life events were assessed by using a list of threatening experience questionnaire with minimum 0 and maximum 6 scores. Scores ≥ 1 considered that women who experience stressful life events and the list threatening experience has good test-retest reliability and predictive validity and the inter-rater reliability revealed, Kappa: 0.61–0.87.^{30,31} Social support was assessed by using the 3-Item Oslo social support scale and scores 3–8 = poor social support, 9–11 = intermediate social support, and 12–14 = strong social support.³² Intimate partner violence was considered when women score four or more symptoms of the eight items Woman Abuse Screening Tool (WAST) which measures physical, sexual, and emotional abuse in the last 12 months. It scored as 0 (never), 1 (sometimes), and 2 (often). The sensitivity is 91.7% and specificity of 100%.^{33,34} Alcohol, Smoking, and Substance Involvement Screening Tool (ASSIST) were used to screen substance use. For alcohol, the cut-off score is ≥ 9.5 with 95% sensitivity and 84% specificity and for tobacco, the cut-off score is ≥ 4 with 97% sensitivity and 62% specificity whereas for Amphetamine (chat) the cut-off score is ≥ 3 with 99% sensitivity and 98% specificity.³⁵

Data Processing and Analysis

The data were entered into the Epi-data version 4.6 statistical program. Then, the data set was exported to (SPSS) version 25 for further analysis. The frequency distribution was used to describe the study population about socio-demographic and other relevant variables. Cross tabulation and chi-square tests were done to compare the depression status between the two groups and to see the presence of

an association between the associated factors and outcome variable. A binary and multivariable logistic regression analysis was used to see the significant association between the outcome and independent variables. Hosmer and Lemeshow test was used to check the model fitness. Independent variables with a p-value of less than 0.25 in the bivariate analysis were entered into the multivariable analysis. In the final model, a significant association was declared at a p-value 0.05 or less. The results were presented in text and tables with adjusted odds ratio (AOR) and the corresponding 95% confidence interval.

Ethics Approval and Consent to Participate

The study was conducted after ethical clearance was obtained from the Institutional Review Board (IRB) of Bahir Dar University College of Medicine and Health Sciences. An ethical clearance letter was submitted to Debre Berhan town health administration and an additional supportive letter written and it was disseminated to the study Kebeles. Assent was taken for those participants' age 15–17 years from their guardian or parents. Participant's information was kept confidential and not shared with a third party. Women's written informed consent has taken regarding their willingness to participate in the study. Participants that found to be at risk of depressive symptoms were referred to a psychiatric evaluation in the hospital. This study was conducted following the declaration of Helsinki.

Result

Socio-Demographic Characteristics of Participants

Among normal weight, a total of 1007 study participants were successfully interviewed with a response rate of 96.1%, whereas among overweight women 100%.

The median age of study participants was 24 years for normal-weight women and 31 years for overweight women with a minimum age of 15 years and a maximum of 49 years. Forty percent of study participants were in the age group of 15–24 years. The largest proportions of respondents (92.2%) were Orthodox Tewahedo Christian followers.

The highest number of overweight participants were housewives 152 (29.1%) followed by government-employed 138 (26.4%). Whereas from normal-weight participants, (36.4%) were students followed by a housewife (21.9%).

Regarding family average monthly income, 779 (77.4%) of the normal-weight women and 451 (86.2%) overweight women monthly income above the poverty line (Table 1).

Substance Use, Physical Activity and Nutritional Status-Related Characteristics of Study Participants

Nearly three-fourth (73%) of normal-weight reproductive-age women and 414 (79.2%) among overweight

Table 1 Socio-Demographic Characteristics of Normal and Overweight Reproductive Age Women in Debre Berhan Town, 2020

Variables	Normal Weight Women n=1007	Overweight Women n=523	Total N=1530
Age			
15–24	514 (51%)	102 (19.5%)	616 (40.3%)
25–34	322 (32%)	212 (40.5%)	534 (34.9%)
35–44	131 (13%)	158 (30.2%)	289 (18.9%)
45–49	40 (4%)	51 (9.8%)	91 (5.9%)
Religion			
Orthodox tewahedo	948 (94.1%)	465 (88.9%)	1413 (92.3%)
Protestant	42 (4.2%)	43 (8.2%)	85 (5.6%)
Muslim	15 (1.5%)	12 (2.3%)	27 (1.8%)
Others*	2 (0.2%)	3 (0.6%)	5 (0.3%)
Ethnicity			
Amhara	991 (98.5%)	507 (96.9%)	1498 (98%)
Oromo	11 (1.1%)	11 (2.1%)	22 (1.5%)
Others**	5 (0.4%)	5 (1%)	8 (0.5%)
Marital status			
Married	378 (37.5%)	299 (57.2%)	677 (44%)
Single	589 (58.5%)	181 (34.6%)	770 (50.3%)
Divorced	34 (3.4%)	33 (6.3%)	67 (4.7%)
Widowed	6 (0.6%)	10 (1.9%)	16 (1%)
Educational status			
No formal education	41 (4.1%)	23 (4.4%)	64 (4.2%)
Primary school	152 (15.1%)	61 (11.6%)	213 (13.9%)
Secondary school	280 (27.8%)	138 (26.4%)	418 (27.3%)
College/university	534 (53%)	301 (57.6%)	835 (54.6%)
Family monthly income			
Above poverty line	779 (77.4%)	451 (86%)	1230 (80.4%)
Below poverty line	228 (22.6%)	72 (14%)	300 (19.6%)

Notes: Others*= Yehiwa miskir, Catholic & Mulu wengel, **Tigrie and Debub nation and nationalities.

reproductive-age women used life time alcohol. Among normal weight 4(0.4%) and 7(1.3%) of overweight women use khat in their life time. There was no alcohol use disorder among normal weight; whereas among overweight 3(0.6%) had the problem. Concerning cigarette smoking, only 2(0.2%) normal weight reproductive-age women were used in their lifetime. Whereas among overweight no smoker at all.

Majority of normal and overweight women had high level of physical activity 464 (46%) and 284 (54.3%) respectively. Among normal weight participants, 56% of them had vegetables in their regular meal while half of overweight women had vegetables in their regular meal (Table 2).

Clinical and Psycho-Social Factors-Related Characteristics of Study Participants

From the total participants, 19 (1.9%) normal weight and 27 (5.2%) overweight women had chronic medical illness. Hypertension was the most common medical illness, 13 (68.4%) among normal weight, and 16 (59.3%) among overweight women. Of the overall normal-weight women, three and from overweight two individuals had a history of mental illness other than depression. A family history of depression was reported only among four normal-weight women.

From the total normal-weight women 45 (4.5%) had abortion whereas among overweight women 49 (9.4%). Additionally, majority of normal weight and overweight participants had moderate social support 582 (57.8%) and 271 (51.8%) respectively. Out of the total participants from normal weight 135 (13.4%) and from overweight participants 78 (14.9%) had stressful life events (Table 3).

Depression Status Comparison Among Normal and Overweight Reproductive-Age Women

The total prevalence of Depression among all reproductive-age women was 28.37% (95% CI, 26.1–30.63).

The prevalence of Depression among normal and overweight reproductive-age women was 26.02% with (95% CI, 23.3, 28.73) and 32.89% with (95% CI, 28.85, 36.93) respectively.

Associated Factors of Depression Among Normal Weight Reproductive-Age Women

All the candidate variables which fulfill p-value less than 0.25 in the binary logistic regression assumptions were entered into multivariable binary logistic regression and p-value < 0.05 was considered significant.

Table 2 Substance Use, Physical Activity and Nutritional Status-Related Characteristics of Study Participants Among Normal and Overweight Reproductive Age Women in Debre Berhan Town, 2020

Variables	Category	Normal Weight Women N=1007	Overweight Women n=523	Total N=1530	
Physical activity	Very low	51 (5.1%)	24 (4.6%)	75 (4.9%)	
	Low	174 (17.3%)	64 (12.2%)	238 (15.6%)	
	Moderate	318 (31.6%)	151 (28.9%)	469 (30.6%)	
	High	464 (46%)	284 (54.3%)	748 (48.9%)	
Nutritional status	Daily milk product, meat and egg	Yes	287 (28.5%)	165 (16.4%)	452 (29.5%)
		No	720 (71.5%)	358 (83.6%)	1078 (70.5%)
	Daily grain products	Yes	467 (46.4%)	227 (22.5%)	694 (45.5%)
		No	540 (53.6%)	296 (77.5%)	836 (54.5%)
	Vegetable and fruit twice/day	Yes	564 (56%)	279 (27.7%)	843 (55%)
		No	443 (44%)	244 (72.3%)	687 (45%)
Substance history	Ever alcohol use	Yes	735 (73%)	414 (79.2%)	1149 (75.1%)
		No	272 (27%)	109 (20.8%)	381 (24.9%)
	Ever smoke cigarette	Yes	2 (0.2%)	–	2 (0.01%)
		No	1005 (99.8%)	523 (100%)	991 (99.99%)
	Ever use Khat	Yes	4 (0.4%)	7 (1.3%)	11 (0.01%)
		No	1003 (99.6%)	516 (98.7%)	1519 (99.99%)

Table 3 Clinical and Psycho-Social Factors-Related Characteristics of Study Participants Among Normal and Overweight Reproductive Age Women in Debre Berhan Town, 2020

Variables	Category	Normal Weight Women n=1007	Overweight Women n=523	Total N=1530
Chronic medical illness	Yes	19 (5.2%)	27 (5.2%)	46 (3%)
	No	988 (94.8%)	496 (94.8%)	1484 (97%)
Hypertension	Yes	13 (1.3%)	16 (3.1%)	29 (1.9%)
	No	994 (98.7%)	507 (96.8%)	1501 (98.1%)
Others*	Yes	6 (0.5%)	11 (1.1%)	17 (1.1%)
	No	1001 (99.5%)	996 (98.9%)	1513 (98.9%)
Abortion	Yes	45 (4.5%)	49 (9.4%)	94 (6.2%)
	No	962 (95.5%)	474 (90.6%)	1436 (93.8%)
Still birth	Yes	12 (1.2%)	19 (3.6%)	31 (2%)
	No	995 (98.8%)	504 (96.4%)	1499 (98%)
Social support	Poor	284 (28.2%)	144 (27.5%)	428 (28%)
	Moderate	582 (57.8%)	271 (51.8%)	853 (55.8%)
	Strong	141 (14%)	108 (20.7%)	249 (16.2%)
Stressful life events	Yes	135 (13.4%)	78 (14.9%)	213 (13.9%)
	No	872 (86.6%)	445 (85.1%)	1317 (86.1%)
Experienced weight stigma	Yes	58 (5.8%)	214 (40.9%)	272 (17.8%)
	No	949 (94.2%)	309 (59.1%)	1258 (82.2%)
Body image disturbance	Yes	438 (43.5%)	232 (44.4%)	670 (43.8%)
	No	569 (56.5%)	291 (55.6%)	860 (56.2%)

Notes: Others = Diabetes mellitus, HIV/AIDS and Epilepsy.

The odds of developing depression among women with poor and moderate social support was about two times higher than those who had strong social support (AOR=1.97, 95% CI, 1.14, 3.95), and 1.98 (AOR=1.98, 95% CI, 1.19, 3.3) respectively.

Additionally, the odds of depression among women who had stressful life events were 3.44 times higher than women who had no stressful life events (AOR=3.44, 95% CI=2.32, 5.1). Depression among women having experience of weight stigma was 2.45 times higher than those without experience of weight stigma (AOR= 2.45, 95% CI= 1.4, 4.32).

This study also revealed that body image disturbance was significantly associated with developing depression (AOR=1.98, 95% CI, 1.47, 2.66) (Table 4).

Associated Factors of Depression Among Overweight Reproductive-Age Women

All the candidate variables which fulfill p-value less than 0.25 in the binary logistic regression assumptions were entered into multivariable binary logistic regression and p-value < 0.05 was considered significant.

Being age with the range of 35 to 44 was about 2.55 times more likely to have depression as compared to age with the range of 45 to 49 (AOR= 2.55, 95% CI (1.16, 5.6)). Among women with chronic medical illness were about 2.9 times more likely to have depression as compared to without chronic medical illness (AOR= 2.92, 95% CI (1.17, 7.2)). This study also revealed that overweight women with experienced weight stigma were 2.23 more likely to develop depression as compared to women who had not experienced weight stigma (AOR= 2.23, 95% CI= 1.5, 3.35) (Table 5).

Associated Factors of Depression Among Reproductive-Age Women

All the candidate variables which fulfill p-value less than 0.25 in the binary logistic regression assumptions were entered into multivariable binary logistic regression and p-value < 0.05 was considered significant.

Being overweight was 1.34 times more likely to develop depression as compared to normal-weight women (AOR=1.338, 95% CI, 1.1, 1.74). On the other hand, odd of depression among women with chronic

Table 4 Bivariate and Multivariable Analysis Associated Factors of Depressive Symptoms Among Normal Weight Reproductive Age Women in Debre Berhan Town, 2020

Variables	Response	Depressive Symptoms N=1007		COR(95%, CI)	AOR(95%, CI)
		Yes	No		
Social support	Poor	84	200	2.3 (1.35, 3.83)	1.97 (1.14, 3.4)**
	Moderate	156	426	1.98 (1.21, 3.24)	1.98 (1.19, 3.3)**
	Strong	22	119	1	1
Stressful life events	Yes	67	68	3.4 (2.36, 4.97)	3.44 (2.32, 5.1)*
	No	195	677	1	1
Experienced weight stigma	Yes	26	32	2.46 (1.43, 4.2)	2.45 (1.39, 4.32)**
	No	236	713	1	1
Body image Disturbance	Yes	150	288	2.13 (1.6, 2.83)	1.98 (1.47, 2.66)*
	No	112	457	1	1

Notes: *p-value ≤ 0.0001 (highly significant), **p-value ≤ 0.05 (significant), 1= Reference.

Abbreviations: COR, crude odds ratio; AOD, adjusted odds ratio.

Table 5 Bivariate and Multivariable Analysis Associated Factors of Depressive Symptoms Among Overweight Women Debre Berhan Town, 2020

Variables	Category	Depressive Symptoms N=523		COR(95%, CI)	AOR(95%, CI)
		Yes	No		
Age	15–24	30	72	1.1 (0.52, 2.33)	1.36 (0.6, 3.2)
	25–34	64	148	1.143 (0.58, 2.26)	1.46 (0.7, 3.18)
	35–44	64	94	1.8 (0.9, 3.595)	2.55 (1.16, 5.6)**
	45–49	14	37	1	1
Chronic medical illness	Yes	16	11	3.17 (1.44, 6.99)	2.92 (1.17, 7.2)**
	No	156	340	1	1
Stressful life events	Yes	49	29	4.42 (2.67, 7.32)	4.38 (2.54, 7.56)*
	No	123	322	1	1
Body image disturbance	Yes	103	129	2.57 (1.77, 3.74)	2.54 (1.68, 3.8)*
	No	69	222	1	1
Experienced weight stigma	Yes	99	115	2.78 (1.91, 4.1)	2.23 (1.5, 3.35)*
	No	73	236	1	1

Notes: *p-value ≤ 0.0001 (highly significant), **p-value ≤ 0.05 (significant), 1= Reference.

Abbreviations: COR, crude odds ratio; AOD, adjusted odds ratio.

medical illness was 3.3 times higher compared to free from chronic medical illness (AOR=3.3, 95% CI, 1.7, 6.34).

Women with poor social support 1.8 times more likely to develop depression as compared to those who had strong social support (AOR=1.8, 95% CI, 1.2, 2.65) (Table 6).

Discussion

The finding of this study revealed that the prevalence of depression among overweight women (32.9%) higher as

compared to normal weight reproductive age women (26%). Associated factors among normal-weight women were found poor and moderate social support, stressful life events, experienced weight stigma, and body image disturbance whereas among overweight women were, age range from 35 to 44, chronic medical illness, body image disturbance, stressful life events, and experienced weight stigma.

According to this study, the prevalence of depression among normal weight is higher as compared to studies done in Central Pennsylvania (13.3%),¹¹ Canada

Table 6 Bivariate and Multivariable Binary Logistic Analysis Associated Factors of Depressive Symptoms Among Reproductive Age Women in Debre Berhan Town, 2020

Variables	Value	Depressive Symptoms N=1530		COR, 95% CI	AOR, 95% CI
		Yes	No		
Weight status	Overweight	172	351	1.39 (1.11, 1.75) 	1.34 (1.1, 1.74)**
	Normal	262	745		
Chronic medical illness	Yes	27	19	3.76 (2.1, 6.84) 	3.26 (1.7, 6.34)*
	No	407	1077		
Social support	Poor	145	283	1.94 (1.35, 2.8) 1.46 (1.04, 2.05) 	1.8 (1.2, 2.7)** 1.59 (1.11, 2.3)**
	Moderate	237	616		
	Strong	52	197		
Stressful life events	Yes	116	97	3.76 (2.8, 5.1) 	3.69 (2.7, 5)*
	No	318	999		
Body image Disturbance	Yes	253	417	2.28 (1.8, 2.85) 	2.3 (1.8, 2.9)*
	No	181	679		

Notes: *p-value ≤ 0.0001 (highly significant), **p-value ≤ 0.05 (significant), | = Reference.

Abbreviations: COR, crude odds ratio; AOD, adjusted odds ratio.

(6.2%),¹² Norway (7.43%),²² Denmark (12.7%),²⁰ Australia (12%),³⁶ Chinese (5.8%)³⁷ and Korea (6.5%).¹⁵ The discrepancy might be due to variation in study design, which was a cohort in Central Pennsylvania, Denmark, and Australia. Cultural differences, participant's age variation, data collection time, and environmental condition are the reason behind the discrepancy. In this study, the data were collected during stressful life situation due to coronavirus (covid-19) pandemic and it may inflate the prevalence of depressive symptoms. The difference in the assessment tool of depression might be another reason for this variation. For instance, depression was assessed by using CESD-10 study in Denmark, Taiwanese questionnaire used to study in Chinese, and even PHQ-9 variation in cut-off scores which was score ≥ 10 studies in Korea and Australia; but ≥ 5 was in this study. The finding of this study is comparable with the study done in Australia (23%),¹³ whereas lower when compared to the study done in Canada (29%).²¹ The variation might be due to lifetime depression experience was included among study done in Canada, but in this study incorporated only the current depression status.

Among overweight women the prevalence of depression in this study is higher as compared to studies in Central Pennsylvania (18.9%),¹¹ Canada (6.1%),¹² and (27.4%),²¹ Norway (8.52%),²² Denmark (16%),²⁰ Australia (28.2)¹³ and (13.6%),³⁶ Chinese (6.1%)³⁷ and Korea (5.9%).¹⁵ The discrepancy may be due to variation in study design and sampling technique, which was

a cohort study in Pennsylvania, Denmark, and Australia. Cultural differences, participant's age variation, data collection time, and environmental condition are the reason behind the discrepancy. In this study, the data collection time was a very stressful environment due to the coronavirus (covid-19) pandemic and it may inflate the prevalence of depression. The difference in approaches taken to quantify depression might be another reason for this variation. For instance, depression was assessed by using CESD-10 study in Australia, even PHQ-9 variation in cut-off scores which was score ≥ 10 studies in Korea and Australia; but ≥ 5 was in this study. This study results in line when compared to the study done in Chinese (31.98%),²³ but lower than the USA 38%.¹⁰ This discrepancy might be due to the variation in study design which was a cohort in the United States of America, age variation, and the assessment tool used to quantify depression might be another reason for this variation.

Regarding the associated factors of depression, having poor and moderate social support among normal-weight women were twice more likely to develop depression than women with strong social support. This result was supported by a study conducted in the United States of America.¹⁶ This might be due to the installation of hope, enhancing self-esteem, potentiating of quality of life, increasing the quality of psychological wellbeing, and developing different coping mechanisms among women with strong social support. It also acts as a buffer against stressful life events which is a significant risk factor for depression.^{38,39}

A stressful life event is one of the significant risk factors for depression. Normal weight women who experience stressful life events were 3.4 times whereas overweight women were 4.4 times more likely to encounter depression than those who have not stressful life events. This finding was consistent with a systematic review done in the United States of America.⁴⁰ Stress result in a long-lasting change in the brain biology and the functional states of various neurotransmitters and intraneuronal signal system, change that loss of neuron and excessive reduction in synaptic contact and also stress reduces numerous brain proteins that are responsible for neuronal growth and synapse formation this lead to depression.⁴¹

Regarding body image disturbance, normal-weight women with body image disturbance found two times more likely to develop depression than those who were well satisfied by their body image. Overweight women with body image disturbance found 2.5 times more likely to experience depression than those who were well satisfied by their body image. It was consistent with the study done in Korea,¹⁴ the Netherland,⁵ and in the united states of America.¹⁷ The possible reason for this might be due to the disturbance in self-perception especially associated to fear of increasing body weight and its stigmatization, low self-esteem, and also irrelevant excessive concern on body shape, which favors the development of disturbances in eating behaviors and patterns and psychological disturbance, is a predictive factor for depression.^{42,43}

Among overweight women with an age range from 35 to 44 years were 2.6 times more likely to develop depression than those women with an age range from 45 to 49 years. This is consistent with other studies in Canada,¹² Pennsylvania,¹¹ and Korea.¹⁵ This might be due to when women increase their age less likely to react to body image, weight stigma, and weight-related distressing conditions. During this age period, the women are highly concerned about being menopause and during a perimenopause period or menopausal transition mood is highly affected because it is associated with a variety of biological and psychological changes.^{44,45}

Experienced weight stigma among overweight women was 2.2 times more likely leads to depression as compared to those who have not experienced weight stigma whereas in normal-weight women 2.5 times more likely. This finding is supported by a study from Korea¹⁴ and in the United States.¹⁸ Women with experienced weight stigma might have psychological disturbance mainly associated with low self-esteem, hostility, and maladaptive schemas, and

social isolation; which might predispose them to develop depression.^{18,46}

Chronic medical illnesses appear to be strongly associated with depression in an overweight individual. The finding of this study revealed that overweight women with chronic medical illness were 2.9 times more likely to develop depression than who have not the illness. This finding was consistent with the study done in the United States of America and Canada.^{10,12} The possible reason for this might be due to the complication of the medical illness. The direct and indirect biological, psychological, social, and economic impact of chronic medical illness may also lead to depression.^{1,47}

Strength of the Study

The present study lies in the fact that, done at community level with large sample size using validated tool. Analytical study using comparison group for depressive symptoms among women with normal weight and overweight, and since there is no previous study done on depressive symptoms among normal and overweight women; this research will serve as baseline for other studies.

Limitations of the Study

Since data collection was done by face-to-face interviews, depression may be underestimated due to social desirability bias. The study not incorporates underweight and obese women. Also, the study used a cross-sectional design, which hindered the accurate examination of the causal relationship between overweight and depression risk.

Conclusion and Recommendation

This study identified the prevalence of depression among overweight women was high compared to normal weight. Additionally, this study revealed that poor and moderate social support, stressful life events, experienced weight stigma, and body image disturbance significantly associated with depression in normal weight women. Furthermore, 35 to 44 age group, chronic medical illness, body image disturbance, stressful life events, and experienced weight stigma were significantly associated in overweight women in Debre Berhan town. Promoting social support at any aspect of health care service is very important to minimize depression. Especially for overweight women, encouraging early management of medical illness, coping mechanisms for different stressful life events and to have normal weight are a vital means to prevent

depression. Additionally, potentiating self-confidence towards body image and educating the community about stigma and its effect are other get way to overcome depression. Therefore, a collaboration of different stakeholders and an integrated effort should be applied to overcome the current burning problem and to scale up reproductive age women mental health care service.

Abbreviations

AOR, Adjusted Odds Ratio; BMI, Body Mass Index; BSc, Bachelor of Science; CI, Confidence Interval; CIDI, Composite International Diagnostic Interview; COR, Crude Odds Ratio; MET, Metabolic Equivalent; PHQ-9, Patient Health Questionnaire; SPSS, Statistical Package for Social Science; SSI, Stigmatizing Situation Inventory; WHO, World Health Organization.

Data Sharing Statement

The data used to support the findings of this study are available from the corresponding author upon request.

Acknowledgment

First of all, we would like to thank God for giving us the courage and wisdom to do our work. Then, we would like to mention and pass our thanks to Bahir Dar University College of Medicine and Health Sciences, department of psychiatry for giving this chance. We extend our deepest gratitude to our friends and colleagues for giving us materials, their guidance in our overall work, and also for their irreplaceable support and sharing their experience. We finally thank Debre Berhan town health bureau and administrative bodies for permitting us to do so as well as involved data collectors and supervisors for their commitment during the data collection process.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

The whole required (material and humanitarian) cost for this research work was covered by Bahir Dar University.

Disclosure

The authors declare that they have no competing interests.

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