



Mental Health After Childbirth in Women with Previous Bariatric Surgery: The SPOTmom Pilot Study



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ABSTRACT

Introduction Currently, no data are available using standardized instruments for evaluating the postpartum mental health of women with previous bariatric surgery. The aim of this pilot study was to assess postpartum mental health in women following bariatric surgery and to establish appropriate tools for a prospective registry study in the future.

Methods In this survey, the mental health of 22 women during the first weeks postpartum was examined (T1) and their status at least 6 months after childbirth was prospectively assessed (T2). Symptoms of depression and anxiety were evaluated with standardized questionnaires and depression was diagnosed with structured diagnostic interviews (SCID-5).

Results At T1, 3/22 women (14%) reported depressive or anxiety symptoms, and in these women, the diagnosis of depression was established. In comparison with T1, at T2, symptomatology for depression or anxiety increased to 32% and 27% of patients, respectively, but only one woman was diagnosed with depression. In comparison to patients without symptoms, patients with signs of depression or anxiety or both had lower total body weight loss and, more often, a personal or family history of depressive disorders.

Conclusion Our pilot study suggests that the rate of postpartum depression in women after BS might be higher than in the general population. High symptom levels of depression and anxiety emphasize the necessity of long-term bariatric follow-up care. Further research is needed to evaluate if prevalence of depression or anxiety disorder or both is higher in this patient group as compared to other patients after bariatric surgery.

Introduction

In patients seeking bariatric surgery (BS), psychiatric disorders are common, with a prevalence of 19% for depression being more than twice as high as in the general population [1]. Available evidence has shown an improvement in mental health status after surgery, but recent meta-analyses suggest deterioration several years post-operatively [2, 3].

The majority of patients with BS are women, many of them of reproductive age [4], whose fertility usually improves after surgery [5].

Postpartum depression (PPD) is one of the most common and disabling complications of childbirth [6]. PPD has substantial comorbidity with anxiety disorders, which are also common in the postpartum period and merit clinical attention [7].

Recent meta-analyses revealed higher rates of postpartum depressive symptoms for women with overweight (OR 1.14) and even higher rates for women with obesity (OR 1.39) as compared to women with normal weight or overweight [8]. Due to limited data, the association between body mass index (BMI) and postpartum anxiety disorders remains uncertain [8].

Data on the perinatal mental health of women following BS is scarce. Jans et al. (2017) found increased anxiety but no differences in depressive symptoms in 54 women after BS as compared to 25 pregnant women with obesity without BS [9]. Since 2021, four studies have addressed antenatal depression and anxiety reporting higher rates in women after BS than in pregnant women with or without obesity [10–13].

Only one study focused on postpartum mental health in patients following BS [10]. Records of 132 Brazilian women were reviewed for diagnoses of pharmacologically treated depression and anxiety during pregnancy and a prevalence of 13.6% was reported. Additionally, newly diagnosed PPD (clinically diagnosed or self-reported) was found in 7.6% of women.

Despite potentially severe consequences of PPD, the postpartum mental health of women following BS has not yet been examined with standardized instruments. i. e., standardized questionnaires or interviews.

The “SPoTmom study” is a pilot study examining PPD and anxiety with the goal of establishing a prospective registry of women with pregnancy after BS in the future. SPoTmom examines (1) the prevalence of depression diagnoses using a diagnostic interview and (2) the prevalence of symptoms of depression and anxiety using standardized questionnaires.

Methods

Study design and participants

Data were collected from January to May 2020 at two certified obesity centers (Würzburg and Heide, Germany). Women of at least 18 years of age with BS prior to pregnancy were eligible if childbirth dated back at least 6 months. The survey only covered the first pregnancy following BS while subsequent pregnancies were not analyzed. The study protocol was approved by the Ethics Committee of the University of Würzburg (#62/19) and complied with the principles of the Declaration of Helsinki. The trial was registered at clinicaltrials.gov (NCT04297956). Written informed consent was obtained from all participants prior to any study-related investigation.

Study course

Patients meeting the inclusion criteria were identified and an appointment for the survey was scheduled. Patients were asked for demographic data and their current mental health status (T2) as well as their recalled mental health status in the first 4–6 weeks after giving birth (T1). Before answering questionnaires retrospectively, patients were interviewed by a psychologist with a detailed discussion of the postpartum period to facilitate recall of past symptoms.

Initially, the survey was implemented during post-bariatric aftercare visits. After the coronavirus disease 2019 (COVID-19) outbreak in Germany at the end of February 2020, face-to-face data collection was canceled and questionnaires were sent by mail and patients were interviewed by phone.

Variables and measurements

Demographic data were obtained at T2. Patients were asked for their current weight, weight at the time of BS, dates of BS, and childbirth. BMI, change in BMI, and time intervals were calculated.

Standardized questionnaires were used to screen for depressive and anxiety disorders and assess the severity of symptoms. To examine current symptoms of depression, patients were asked to complete three different questionnaires (Patient Health Questionnaire 9 (PHQ-9) [14], Edinburgh Postnatal Depression Scale (EPDS) [15], Beck Depression Inventory II (BDI-II) [16]). For T2, patients were only defined as having symptoms of depression when reaching the cutoff in at least two out of the three depression questionnaires. In order not to overstrain patients, there was only one questionnaire for current and a retrospective symptoms of anxiety [General Anxiety Disorder 7 (GAD-7) [17] and the retrospective investigation of depressive symptoms (PHQ-9). For retrospective assessment, instructions of the questionnaires were modified: Instead of asking for symptoms in the previous two weeks, patients were asked for symptoms within 4 to 6 weeks after giving birth. Cutoff scores were determined according to literature recommendations. To achieve a high sensitivity to detect patients at risk, cutoff scores of ≥ 10 were defined for PHQ-9 [14, 18], EPDS [15] and GAD-7 [17] and ≥ 13 for BDI-II [19].

To formally establish the diagnosis of depression, modules A-D of the clinical version of the Structured Clinical Interview for DSM-5 (SCID-5) [20] were conducted. SCID captures current diagnosis and can measure lifetime prevalence asking for the worst episode of symptoms in the past. For this study, a question was added to determine the prevalence of depressive disorders within the first 4 weeks postpartum.

Statistical analysis

Solely descriptive statistics was used to present the demographics and survey responses. Due to the small sample size, demographic data are presented as median with interquartile range (IQR). Questionnaire scores are primarily presented as mean with SD for comparability across studies.

Results

Sample description

The sample comprised $n = 22$ women (Würzburg $n = 19$, Heide $n = 3$, median age 36.0 years, IQR 30.3–38.0). Median current BMI was 36.2 (29.3–39.5) kg/m² and preoperative BMI was 54.7 (47.5–56.5) kg/m². Further patients' characteristics are depicted in ► **Table 1**.

► **Table 1** Patient characteristics at T2 (n = 22).

Age (years)	36.0 (30.3–38.0)
Current BMI (kg/ m ²)	36.2 (29.3–39.5)
German nationality	22 (100.0)
Obesity center Würzburg / Heide	19 (86.4) / 3 (24.6)
Marital status (n = 22)	
Married	15 (68.2)
Being allied	4 (18.3)
Divorced	2 (9.1)
Separated	1 (4.5)
Employment status (n = 20)	
Employed	10 (50.0)
Parental leave	6 (30.0)
Housewife	2 (10.0)
Seeking work	2 (10.0)
Pregnancy and birth (n = 22)	
Primiparous women*	15 (71.4)
History of miscarriage	7 (31.8)
Planned pregnancy	14 (63.6)
In-vitro fertilization	2 (9.1)
Singleton pregnancy	22 (100.0)
Pregnancy complications	10 (45.5)
Gestational diabetes	3 (13.6)
Preeclampsia	0 (0.0)
Hyperemesis	2 (9.1)
Preterm birth	1 (4.5)
Vaginal bleeding	3 (13.6)
Hypertension	1 (4.5)
Other	4 (18.2)
Birth complications	5 (22.7)
Cesarian section	10 (45.5)
Breastfeeding	14 (63.6)
Health status	
Current diseases*	9 (42.9)**
Type 2 diabetes	0
Hypertension	0
Dyslipidemia	1 (4.5)
Medication intake*	11 (52.4)
Antidiabetics / /	0
Antihypertensives	0
Lipid-lowering drugs	1 (4.8)
Antidepressants/ anxiolytics	1 (4.8)
Diseases remitted after BS*	
Type 2 diabetes	5 (23.8)
Hypertension	7 (33.3)
Dyslipidemia	2 (9.5)
Type of primary surgery (n = 22)	
Roux-en-Y gastric bypass	12 (54.5)
One anastomosis gastric bypass	1 (4.5)
Sleeve gastrectomy	9 (40.9)
Secondary BS before pregnancy	3 (14.3)
Time intervals (n = 22)	
Interval surgery – childbirth (months)	29.3 (20.7–45.5)
Interval surgery – survey (months)	62.2 (43.7–85.9)
Interval childbirth – survey (months)	21.1 (14.1–42.9)

► **Table 1** Continued.

Weight trajectory (n = 20)	
BMI (kg/ m ²)	
Preoperative	54.7 (47.5–56.5)
T1	52.0 (± 6.0)
T2	33.9 (31.7–37.6)
T2	34.9 (± 6.7)
T2	36.2 (29.3–39.5)
T2	35.7 (± 7.3)
Change in BMI (kg/ m ²)	
Preoperative vs. T1	– 17.9 (– 12.9 – – 22.7)
T1 vs. T2	– 17.2 (± 8.2)
T1 vs. T2	0.8 (– 0.5–2.0)
T1 vs. T2	0.8 (± 2.3)
%TWL (%)	
Preoperative vs. T1	33.6 (27.9–39.5)
T1 vs. T2	32.1 (± 14.1)

Annotation 1: Variables are presented as median (interquartile range) or n (%). For weight trajectory mean and SD are presented additionally. BS: bariatric surgery; BMI: body mass index; TWL: total weight loss; * information for “primiparous woman”, “existing diseases”, “remitted diseases”, and “medication intake” was only available in 21 women; ** *lipedema* (2), *bronchial asthma* (2), *multiple endocrine neoplasia 1 (MEN 1)* (1), *hypothyroidism* (1), *polycystic ovary syndrome* (1), *post-traumatic stress disorder* (1), *gestational diabetes* (1).

Psychopathology

Patients were defined as showing signs of depression or anxiety or both (“patients with dep/anx”) when reaching the predefined questionnaire cutoff value in PHQ-9 (T1) / GAD-7 (T1 or T2) or in at least 2 out of 3 depression questionnaires at T2 or obtaining a diagnosis of any depressive disorder according to SCID-interview.

Overall, 8 of 22 patients (36%) showed signs of depression/ anxiety: four of them at both T1 and T2, one patient only at T1 and three patients only at T2. Concerning the type of psychopathology, six patients reported signs of depression as well as anxiety across T1 and T2, one patient only showed depressive symptoms and one patient suffered at least from depression, while for anxiety, a questionnaire was missing.

Depressive disorders

At T1, 3 patients (14%) showed depressive symptoms in PHQ-9. Two of them were also diagnosed with major depressive disorder (MDD) according to the SCID (► **Table 2**). One more patient was diagnosed with “other depressive disorder” as the criteria for MDD were not fulfilled. Her questionnaire data are missing.

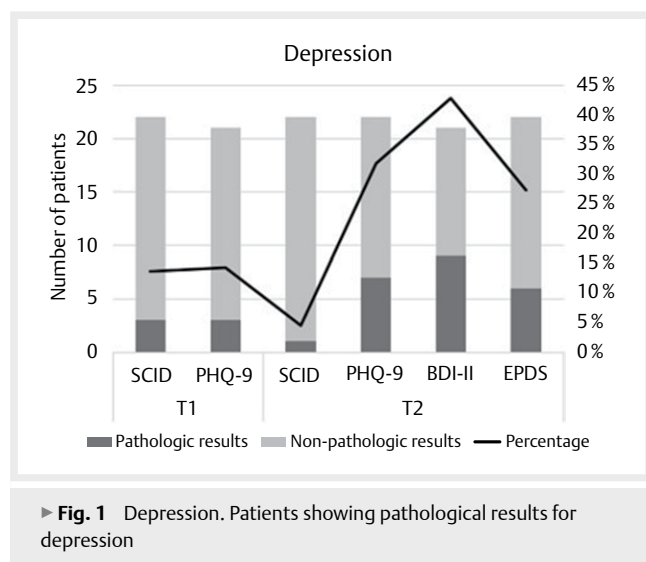
At T2, between 27% and 43% of patients showed symptoms of depression, depending on the questionnaire used. One of those patients (5%) was also diagnosed with MDD at T2 (► **Fig. 1**).

Using the SCID interviews, 12 patients were diagnosed with at least one additional depressive lifetime episode, corresponding to a lifetime prevalence of 55%. Asked for the worst depressive episode apart from T1 or T2, most of the patients reported preoperative episodes. Depressive episodes apart from T1 and T2 are minimum numbers, and further episodes may have occurred at other time points.

► **Table 2** Depression and anxiety: interview and questionnaire results.

		Depression				Anxiety
		SCID	PHQ-9	BDI-II	EPDS	GAD-7
T1	Total, n	22	21	/	/	21
	Pathologic, n (%)	3 (13.6)	3 (14.3)	/	/	3 (14.3)
	Score, mean ±SD	/	7.1 ± 6.3	/	/	5.1 ± 4.8
	Score, median (IQR)	/	6.0 (3.0–8.0)	/	/	4,0 (2.0–7.0)
T2	Total, n	22	22	21	22	22
	Pathologic, n (%)	1 (4.5)	7 (31.8)	9 (42.9)	6 (27.3)	6 (27.3)
	Score, mean ±SD	/	8.2 ± 5.9	13.5 ± 13.1	7.0 ± 7.3	6.4 ± 6,5
	Score, median (IQR)	/	6.5 (3.3–11.5)	8.0 (3.0–22.0)	4,5 (2.0–11.3)	4.0 (1.3–10.0)

IQR: interquartile range; SD: standard deviation; SCID: Structured Clinical Interview for DSM; PHQ: Patient Health Questionnaire; BDI-II: Beck Depression Inventory II; EPDS: Edinburgh Postnatal Depression Scale; GAD-7: General Anxiety Disorder 7.



Anxiety

At T1, three patients (14%) showed high levels of anxiety symptoms. With three more patients reaching the cutoff at T2, six patients (27%) showed pathological results.

Characterization of patients with depression and/or anxiety

The characteristics of patients with vs. without dep/anx are shown in ► **Table 3**. Patients with dep/anx were older, had a higher BMI, and experienced less weight loss as compared to pre-surgery than patients without dep/anx. Moreover, patients with dep/anx had more often a history of miscarriage and complications during pregnancy.

More of the patients with dep/anx stated having ever been treated because of depressive symptoms (75% vs. 36%) or having family members suffering from depression (63% vs. 50%). Based on SCID, more patients with dep/anx had a depression diagnosis prior to T1 (63% vs. 36%).

Time intervals were analyzed separately for patients with dep/anx at T1 or T2. Patients with dep/anx at T1 gave birth more often within 2 years after BS (60% vs. 24%).

In patients with pathologic results at T2, more time had passed since childbirth [3.3 years (2.8–5.2) vs. 1.7 years (0.9–2.5)] and fewer patients were within the first year postpartum (14% vs. 27%) or with their child in early infancy up to 3 years of age (29% vs. 73%). The median time since surgery was similar for patients with [5.3 years (4.6–7.4)] as compared to patients without dep/anx [5.0 years (3.2–7.1)].

For all patients with dep/anx, surgery dated back more than 3.5 years, while 60.0% of patients without dep/anx were within the first 3.5 years postoperatively. 13.3% of patients without dep/anx were within the first 3.0 years following surgery.

Discussion

To our knowledge, this is the first study using standardized instruments to examine mental health after childbirth in women with previous BS. In the immediate postpartum period (T1), 14% of patients were diagnosed with depression and showed symptoms of depression or anxiety, whereas 21.1 (14.1–42.9) months after childbirth (T2) a depressive disorder could be diagnosed in only 5% of patients. However, symptoms also covering subclinical depression assessed with questionnaires increased to 32%. Anxiety symptoms increased to 27% and were highly comorbid with depressive symptoms.

There is still an ongoing debate about the effects of BMS on depression as well as a possible increase in self-harm and suicide after BS. Several authors reported an increased hazard ratio when comparing patients with their preoperative state or with matched controls [21]. A potential risk was even postulated for patients treated with GLP-1 receptor agonists [22], but while an increase in depressive symptoms and suicide ideation was described in comparison to other antidiabetic treatments, statistically increased risk for suicide attempts or completed suicide has not been confirmed when examining large databases [23, 24]. However, it is generally accepted that the average course of psychological well-being after BS is characterized by an initial “honeymoon” phase with improvement of symptoms of depression and anxiety, while in the long term, a renewed deterioration of psychopathology has been described in systematic reviews, mostly based on self-reported data [2–3].

► **Table 3** Sample characteristics of patients with vs. without signs of depression/ anxiety.

Variables	Patients without dep/anx (n = 14)	Patients with dep/anx (n = 8)
Age (years)	32.5 (30.0–38.0)	37.0 (34.8–38.0)
Current BMI (kg/ m ²)	31.8 (28.4–38.0)	39.5 (35.0–43.0)
Obesity center Würzburg	12 (85.7)	7 (87.5)
Marital status		
Married	8 (57.1)	7 (87.5)
Being allied	4 (28.6)	0 (0)
Divorced	1 (7.1)	1 (12.5)
Separated	1 (7.1)	0 (0)
Employment status		*
Employed	7 (50.0)	3 (42.9)
Parental leave	4 (28.6)	2 (28.6)
Housewife	1 (7.1)	1 (14.3)
Seeking work	1 (7.1)	1 (14.3)
Pregnancy and birth		
Primiparous women	11 (78.6)	4 (57.1)*
History of miscarriage	2 (14.3)	5 (62.5)
Planned pregnancy	9 (64.3)	5 (62.5)
In-vitro fertilization	0	2 (25.0)
Pregnancy complications	4 (28.6)	6 (75.0)
Gestational diabetes	1 (7.1)	2 (25.0)
Hyperemesis	1 (7.1)	1 (12.5)
Preterm birth	1 (7.1)	0
Bleeding	1 (7.1)	2 (25.0)
Hypertension	1 (7.1)	0
Other	1 (7.1)	3 (37.5)
Birth complications	3 (21.4)	2 (25.0)
Cesarian section	6 (42.9)	4 (50.0)
Breastfeeding	8 (57.1)	6 (75.0)
Health status (n)	**	
Current diseases***	5 (38.5)	4 (50.0)
▪ Type 2 diabetes	0	0
▪ Hypertension	0	0
▪ Dyslipidemia	0	1 (12.5)
Current medication intake	5 (38.5)	6 (75.0)
▪ Antidiabetics	0	0
▪ Antihypertensives	0	0
▪ Lipid-lowering drugs	0	1 (12.5)
Diseases remitted after BS*		
▪ Type 2 diabetes	1 (7.1)	3 (37.5)
▪ Hypertension	4 (28.6)	4 (50)
▪ Dyslipidemia	1 (7.1)	1 (12.5)
Type of primary surgery		
Roux-en-Y gastric bypass	8 (57.1)	4 (50.0)
One anastomosis gastric bypass	1 (7.1)	0 (0.0)
Sleeve gastrectomy	5 (35.7)	4 (50.0)
Secondary BS before pregnancy	1 (7.7)	2 (25.0)
Weight trajectory	**	*
BMI (kg/ m ²)		
Preoperative	54.6 (49.0–56.3)	55.8 (47.3–56.8)
	51.2 (±6.9)	53.6 (±7.9)

► **Table 3** Continued.

Variables	Patients without dep/anx (n = 14)	Patients with dep/anx (n = 8)
T1	34.0 (29.8–37.5)	33.9 (33.6–39.4)
	33.5 (±6.7)	37.4 (±6.4)
T2	34.3 (28.4–38.3)	39.4 (34.6–41.7)
	33.8 (±7.2)	39.4 (±6.4)
Change in BMI (kg/ m ²)		
Preoperative vs. T1	–19.1 (–14.5 – –23.7)	–13.9 (–12.7 – –20.6)
	–17.6 (±9.2)	–16.2 (±6.5)
T1 vs. T2	0.6 (–1.4–1.4)	1.9 (0.4–2.3)
	0.2 (±1.8)	1.9 (±2.8)
%TWL (%)		
Preoperative vs. T1	37.3 (31.2–43.1)	29.1 (27.8–35.9)
	33.3 (±16.4)	29.8 (±9.2)

Annotation: Variables are presented as median (interquartile range) or n (%). For weight trajectory mean and SD are presented additionally. BS: bariatric surgery; dep/ anx: depression/ anxiety; BMI: body mass index; TWL: total weight loss *for “employment status”, “primiparous women”, and “weight trajectory” only data of seven patients available; ** for “health status” and “weight trajectory” only data of 13 patients available; *** lipedema (2), bronchial asthma (2), multiple endocrine neoplasia 1 (MEN 1) (1), hypothyroidism (1), polycystic ovary syndrome (1), post-traumatic stress disorder (1), gestational diabetes (1).

Concerning T2, for patients with dep/anx, more time had passed since childbirth and fewer women were within the first year postpartum or having infant children. Therefore, in these patients, birth and postpartum do not seem to explain elevated levels of depression or anxiety. Increased symptom levels could be rather due to longer time intervals since BS. In our study, no patient with dep/anx at T2 was within 3 years postoperatively, and almost half of the women without dep/anx were within 3.5 years postoperatively.

However, high symptoms of depression and anxiety at T2 could also be a reaction to the global COVID-19 crisis and its first wave of infections in Germany [25]. On the other hand, symptomatology at T1 may be underestimated due to recall bias, as data collection took place at T2 and the postpartum period was assessed retrospectively [26].

When we compared our results to community samples within the first 6 weeks postpartum from literature using identical methods and cutoffs, we found – descriptively – a higher rate of depressive psychopathology in our patients. In SPOTMom 9.1% of women after BS were diagnosed with postpartum MDD by SCID in comparison to a prevalence of 2.9–5.9% [27–29]. Regarding depressive symptoms according to PHQ-9, literature data showed similar (12.4% – 14.9%) [30–32] or lower (2.5% – 9.0%) [28, 33] prevalence in the general postpartum population than in our cohort (14.3%). However, the prevalence of anxiety symptoms was not different between SPOTMom (14.3%) and the reported prevalence of 10.0–15.0% in the community setting [34, 35].

When comparing our data to that of a cohort also within 2–4 years after BS – which corresponds to T1 – frequency of SCID diagnoses of MDD in the SPOTMom study (9.1%) was similar to results from Hayden et al. reporting 7.3% prevalence of MDD (including

partial remission) and to the 4.4% to 9.7% of MDD diagnoses in non-pregnant patients at different time points after RYGB in a study by Kalarchian et al. [36, 37] Questionnaire scores in our study sample were also in the upper range of comparable published data: The mean score of PHQ-9 in the SPOTmom study was 7.1, while literature results range from 4.3 to 6.7 [38–43]. The mean GAD-7 score of the SPOTmom study (5.1) was similar to scores from literature data (3.4–5.1) [38–40, 43].

As contraception is recommended for 12–24 months postoperatively according to guidelines [44, 45], pregnancy occurring in this period may lead to additional psychological burden still apparent in the early postpartum. This might have been the case in our cohort, as childbirth was more often within the first two years after BS in patients with dep/anx in postpartum.

A lifetime prevalence of 55% for depressive disorders in our patients, mostly emerging preoperatively, is in line with other studies from Germany reporting 50–60% lifetime depressive disorders with SCID in BS candidates [46, 47]. This high prevalence may reflect the given psychological burden of patients presenting for BS [48]. With obesity being accepted as a mediator for higher depression prevalence, future investigations should include a BMI-matched control group.

Patients with dep/anx suffered more often from previous depressive episodes and showed slightly higher rates of family history of depression, which is consistent with literature data [6, 49, 50] and might help to identify patients at even higher risk for an unfavorable course. These patients had also higher current BMI and worse weight loss trajectories. This could be due to higher preoperative BMI [51] or postoperative depression possibly being associated with poorer weight outcomes [52]. Trends of a more frequent history of miscarriage and higher rates of pregnancy complications in patients with dep/anx should be evaluated in further studies with a larger sample size.

Several limitations arising from the nature of the work as a pilot study exist. The sample size was small and no control group was included. Therefore, rather than inferring final conclusions, we aimed to describe preliminary trends and generate hypotheses. Because of the retrospective nature, prevalence rates concerning the early postpartum may be underestimated. As instruments were not validated for retrospective use, with the exception of lifetime prevalence based on SCID, results for T1 must be interpreted with caution. Furthermore, as anxiety disorders were not captured in SCID, statements are only possible at the symptom level. However, SPOTmom has also relevant strengths. It is the very first study to evaluate mental health following childbirth in women with previous BS with standardized instruments. It was possible to differentiate symptom level and valid depression diagnosis by use of SCID interview as gold standard. Comparability was enhanced by a literature search of studies that are consistent in timing and study instruments.

In conclusion, women following BS could have higher prevalence of depression diagnosis and, by trend, higher depression symptomatology within the early postpartum compared to women from the general population while no clear differences in symptoms of anxiety were seen. In the long run, motherhood does not seem to further deteriorate mental well-being when compared to a general postbariatric cohort. The time interval from BS seems to be a more

important factor, emphasizing the necessity of long-term bariatric aftercare. Especially due to possible recall bias underestimating postpartum depressive symptoms, further studies with prospective assessment of depressive symptoms starting from pregnancy, larger sample size, and BMI-matched control group are required for which now this pilot project provides the basis.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Clinical Trial

Registration number (trial ID): NCT04297956, Trial registry: ClinicalTrials.gov (<http://www.clinicaltrials.gov/>), Type of Study: prospective survey, conducted at two centers

Conflict of Interest

The authors declare that they have no conflict of interest.

References

- [1] Dawes AJ, Maggard-Gibbons M, Maher AR et al. Mental health conditions among patients seeking and undergoing bariatric surgery: A meta-analysis. *JAMA* 2016; 315: 150–163
- [2] Gill H, Kang S, Lee Y et al. The long-term effect of bariatric surgery on depression and anxiety. *J Affect Disord* 2019; 246: 886–894
- [3] Spirou D, Raman J, Smith E. Psychological outcomes following surgical and endoscopic bariatric procedures: A systematic review. *Obes Rev* 2020; 21: e12998
- [4] Maggard MA, Yermilov I, Li Z et al. Pregnancy and fertility following bariatric surgery: A systematic review. *JAMA* 2008; 300: 2286–2296
- [5] Milone M, De Placido G, Musella M et al. Incidence of successful pregnancy after weight loss interventions in infertile women: A systematic review and meta-analysis of the literature. *Obes Surg* 2016; 26: 443–451
- [6] Stewart DE, Vigod SN. Postpartum depression: Pathophysiology, treatment, and emerging therapeutics. *Annu Rev Med* 2019; 70: 183–196
- [7] Dennis CL, Falah-Hassani K, Shiri R. Prevalence of antenatal and postnatal anxiety: Systematic review and meta-analysis. *Br J Psychiatry* 2017; 210: 315–323
- [8] Dachew BA, Ayano G, Betts K et al. The impact of pre-pregnancy BMI on maternal depressive and anxiety symptoms during pregnancy and the postpartum period: A systematic review and meta-analysis. *J Affect Disord* 2021; 281: 321–330

- [9] Jans G, Matthys C, Bogaerts A et al. Depression and anxiety: Lack of associations with an inadequate diet in a sample of pregnant women with a history of bariatric surgery—a multicenter prospective controlled cohort study. *Obes Surg* 2018; 28: 1629–1635
- [10] Walter LB, Dolzan D, Areias T et al. Adverse neonatal and obstetric outcomes in a 20-year Brazilian retrospective cohort of pregnancies after bariatric surgery. *Obes Surg* 2021; 31: 2859–2868
- [11] da Rocha ACN, da Cunha ACB, da Silva JF. Prevalence of depression in pregnant women with bariatric surgery history and associated factors. *Rev Bras Ginecol Obstet* 2022; 44: 109–117
- [12] Kim J, Kelley J, Davidson L et al. Depression and anxiety incidence during pregnancy between bariatric surgery patients and matched control subjects. *Obes Surg* 2022; 32: 1962–1968
- [13] Yu Y, Ma Q, Hollenbach S et al. Pregnant women following bariatric surgery: A focus on Maternal Mental Health and Its Impact on Birth Outcomes. *Obes Surg* 2022; 32: 3696–3704
- [14] Kroenke K, Spitzer RL, Williams JB. The PHQ-9: Validity of a brief depression severity measure. *J Gen Intern Med* 2001; 16: 606–613
- [15] Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression. Development of the 10-item Edinburgh Postnatal Depression Scale. *Br J Psychiatry* 1987; 150: 782–786
- [16] Wang YP, Gorenstein C. Psychometric properties of the Beck Depression Inventory-II: A comprehensive review. *Braz J Psychiatry* 2013; 35: 416–431
- [17] Spitzer RL, Kroenke K, Williams JB et al. A brief measure for assessing generalized anxiety disorder: The GAD-7. *Arch Intern Med* 2006; 166: 1092–1097
- [18] Levis B, Benedetti A, Thombs BD. Accuracy of Patient Health Questionnaire-9 (PHQ-9) for screening to detect major depression: Individual participant data meta-analysis. *BMJ* 2019; 365: l1476
- [19] von Glischinski M, von Brachel R, Hirschfeld G. How depressed is "depressed"? A systematic review and diagnostic meta-analysis of optimal cut points for the Beck Depression Inventory revised (BDI-II). *Qual Life Res* 2019; 28: 1111–1118
- [20] Osório FL, Loureiro SR, Hallak JEC et al. Clinical validity and intrarater and test-retest reliability of the Structured Clinical Interview for DSM-5 – Clinician Version (SCID-5-CV). *Psychiatry Clin Neurosci* 2019; 73: 754–760
- [21] Law S, Dong S, Zhou F et al. Bariatric surgery and mental health outcomes: An umbrella review. *Front Endocrinol (Lausanne)* 2023; 14: 1283621
- [22] Li JR, Cao J, Wei J et al. Case Report: Semaglutide-associated depression: A report of two cases. *Front Psychiatry* 2023; 14: 1238353
- [23] Tang H, Lu Y, Donahoo WT et al. Glucagon-like peptide-1 receptor agonists and risk for suicidal ideation and behaviors in U.S. older adults with type 2 diabetes: A target trial emulation study. *Ann Intern Med* 2024; 177: 1004–1015
- [24] McIntyre RS, Mansur RB, Rosenblatt JD et al. The association between glucagon-like peptide-1 receptor agonists (GLP-1 RAs) and suicidality: Reports to the Food and Drug Administration Adverse Event Reporting System (FAERS). *Expert Opin Drug Saf* 2024; 23: 47–55
- [25] (WHO) WHO. Mental Health and COVID-19: Early evidence of the pandemic's impact: Scientific brief. Available https://www.who.int/publications/i/item/WHO-2019-nCoV-Sci_Brief-Mental_health-2022.1
- [26] Takayanagi Y, Spira AP, Roth KB et al. Accuracy of reports of lifetime mental and physical disorders: Results from the Baltimore Epidemiological Catchment Area study. *JAMA Psychiatry* 2014; 71: 273–280
- [27] Navarro P, García-Estevé L, Ascaso C et al. Non-psychotic psychiatric disorders after childbirth: Prevalence and comorbidity in a community sample. *J Affect Disord* 2008; 109: 171–176
- [28] Reck C, Struben K, Backenstrass M et al. Prevalence, onset and comorbidity of postpartum anxiety and depressive disorders. *Acta Psychiatr Scand* 2008; 118: 459–468
- [29] Gjerdingen D, Crow S, McGovern P et al. Postpartum depression screening at well-child visits: Validity of a 2-question screen and the PHQ-9. *Ann Fam Med* 2009; 7: 63–70
- [30] Gjerdingen D, Crow S, McGovern P et al. Changes in depressive symptoms over 0-9 months postpartum. *J Womens Health (Larchmt)* 2011; 20: 381–386
- [31] Maliszewska K, Świątkowska-Freund M, Bidzan M et al. Screening for maternal postpartum depression and associations with personality traits and social support. A Polish follow-up study 4 weeks and 3 months after delivery. *Psychiatr Pol* 2017; 51: 889–898
- [32] Gigantesco A, Palumbo G, Cena L et al. A brief depression screening tool for perinatal clinical practice: The performance of the PHQ-2 compared with the PHQ-9. *J Midwifery Womens Health* 2022; 67: 586–592
- [33] Pawar G, Wetzker C, Gjerdingen D. Prevalence of depressive symptoms in the immediate postpartum period. *J Am Board Fam Med* 2011; 24: 258–261
- [34] Ceulemans M, Foulon V, Ngo E et al. Mental health status of pregnant and breastfeeding women during the COVID-19 pandemic—A multinational cross-sectional study. *Acta Obstet Gynecol Scand* 2021; 100: 1219–1229
- [35] Bodnar-Deren S, Klipstein K, Fersh M et al. Suicidal ideation during the postpartum period. *J Womens Health (Larchmt)* 2016; 25: 1219–1224
- [36] Hayden MJ, Murphy KD, Brown WA et al. Axis I disorders in adjustable gastric band patients: The relationship between psychopathology and weight loss. *Obes Surg* 2014; 24: 1469–1475
- [37] Kalarchian MA, King WC, Devlin MJ et al. Mental disorders and weight change in a prospective study of bariatric surgery patients: 7 years of follow-up. *Surg Obes Relat Dis* 2019; 15: 739–748
- [38] Hilgendorf W, Butler A, Timsina L et al. A behavioral rating system predicts weight loss and quality of life after bariatric surgery. *Surg Obes Relat Dis* 2018; 14: 1167–1172
- [39] Youssef A, Keown-Stoneman C, Maunder R et al. Differences in physical and mental health-related quality of life outcomes 3 years after bariatric surgery: A group-based trajectory analysis. *Surg Obes Relat Dis* 2020; 16: 1837–1849
- [40] Köhler H, Dorozhkina R, Gruner-Labitzke K et al. Specific health knowledge and health literacy of patients before and after bariatric surgery: A cross-sectional study. *Obes Facts* 2020; 13: 166–178
- [41] Schag K, Mack I, Giel KE et al. The impact of impulsivity on weight loss four years after bariatric surgery. *Nutrients* 2016; 8: 721
- [42] Gordon EL, Terrill AL, Smith TW et al. Overvaluation of shape and weight (not BMI) associated with depressive symptoms and binge eating symptoms pre- and post-bariatric surgery. *Obes Surg* 2022; 32: 2272–2279
- [43] McGarrity LA, Terrill AL, Martinez PL et al. The role of resilience in psychological health among bariatric surgery patients. *Obes Surg* 2022; 32: 792–800
- [44] Busetto L, Dicker D, Azran C et al. Practical recommendations of the obesity management task force of the European Association for the Study of Obesity for the Post-Bariatric Surgery Medical Management. *Obes Facts* 2017; 10: 597–632
- [45] Shawe J, Ceulemans D, Akhter Z et al. Pregnancy after bariatric surgery: Consensus recommendations for periconception, antenatal and postnatal care. *Obes Rev* 2019; 20: 1507–1522
- [46] Mühlhans B, Horbach T, de Zwaan M. Psychiatric disorders in bariatric surgery candidates: A review of the literature and results of a German prebariatric surgery sample. *Gen Hosp Psychiatry* 2009; 31: 414–421

- [47] de Zwaan M, Enderle J, Wagner S et al. Anxiety and depression in bariatric surgery patients: A prospective, follow-up study using structured clinical interviews. *J Affect Disord* 2011; 133: 61–68
- [48] Malik S, Mitchell JE, Engel S et al. Psychopathology in bariatric surgery candidates: A review of studies using structured diagnostic interviews. *Compr Psychiatry* 2014; 55: 248–259
- [49] Zacher Kjeldsen MM, Bricca A, Liu X et al. Family history of psychiatric disorders as a risk factor for maternal postpartum depression: A systematic review and meta-analysis. *JAMA Psychiatry* 2022; 79: 1004–1013
- [50] Hutchens BF, Kearney J. Risk factors for postpartum depression: An umbrella review. *J Midwifery Womens Health* 2020; 65: 96–108
- [51] El Ansari W, Elhag W. Weight regain and insufficient weight loss after bariatric surgery: Definitions, prevalence, mechanisms, predictors, prevention and management strategies, and knowledge gaps—a scoping review. *Obes Surg* 2021; 31: 1755–1766
- [52] Alyahya RA, Alnujaidi MA. Prevalence and outcomes of depression after bariatric surgery: A systematic review and meta-analysis. *Cureus* 2022; 14: e25651