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Reproductive Health of Women Electing Bariatric Surgery

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Abstract

Objective—To describe the reproductive health history and characteristics of women having bariatric surgery. To determine whether this differs by age of onset of obesity.

Design—Retrospective and cross sectional analyses of self-reported survey data.

Setting—Six sites of the Longitudinal Assessment of Bariatric Surgery-2 study.

Patients—1538 females having bariatric surgery.

Interventions—None.

Main outcome measures—Reported Polycystic Ovary Syndrome (PCOS), pregnancy and fertility history, contraceptive use, and plans for pregnancies.

Results—Mean age was 44.8 years (range: 18–78); mean BMI was 47.2 kg/m² (range: 33.8–87.3). PCOS had been diagnosed by a healthcare provider in 13.1%. Of women who had tried to conceive, 41.9% experienced infertility; 61.4% had a live birth after infertility. In the whole group, prior live birth was reported by 72.5%. Women who were obese by age 18 were more likely to report PCOS and infertility and less likely to have ever been pregnant compared to women who became obese

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Conflict of interest

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CAPSULE

In women having bariatric surgery, early onset obesity was associated with a higher frequency of reproductive morbidity compared to obesity onset later in life.

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later in life. Future pregnancy was important to 30.3% of women under age 45; while 48.6% did not plan to become pregnant in the future. In the year prior to surgery 51.8% used contraception.

Conclusion—Self report of obesity by age 18 appears to be related to reproductive morbidity later in life. Women undergoing bariatric surgery have important reproductive health care needs including reliable contraception and counseling about plans for postoperative pregnancy.

Keywords

bariatric surgery; obesity; women's health; pregnancy; infertility; polycystic ovary syndrome; contraception

INTRODUCTION

As the prevalence of obesity rises in the United States, women's health providers increasingly encounter obese and severely obese patients, some of whom undergo bariatric surgery to lose weight. Bariatric surgery is the most effective and durable intervention for severe obesity (body mass index [BMI] ≥ 40 kg/m²) (1). In the U.S., the number of bariatric procedures performed has increased from less than 20,000 in 1995 to more than 200,000 in 2006 (2). Women, who are more than twice as likely to be severely obese as men (7% vs. 3% of U.S. adults age 20 and older) (3), make up the majority of bariatric surgery patients (4).

Evidence is beginning to mount that some reproductive health issues, such as infertility and adverse pregnancy outcome can improve following bariatric surgery induced weight loss (5–13). However, there are few published reports describing a broad range of reproductive health characteristics and history in a large cohort of severely obese women prior to bariatric surgery. As part of the Longitudinal Assessment of Bariatric Surgery (LABS-2) study, a multi-center observational study of bariatric surgery patients, we collected survey-based pre-surgical data on female participants' reproductive health history and weights at ages 18, 25, and 30. Using these retrospective and cross sectional data, this report provides a description of the comorbid conditions, reproductive history, and age of onset of obesity of women undergoing bariatric surgery. Additionally, this study highlights opportunities for collaboration between women's health providers and bariatric surgery teams in the areas of contraception and preconception planning.

MATERIALS AND METHODS

Study design and population

LABS-2 is an observational study supported by the National Institutes of Health and Office for Research in Women's Health to assess the risks and benefits of bariatric surgery (14). Adults (at least 18 years) seeking bariatric surgery at participating clinical sites throughout the U.S. are asked to participate in this institutional review board-approved study if they have not had previous weight loss surgery. Remuneration varied by clinical site; maximum remuneration for a baseline research visit was \$25 in the form of cash or a gift card. Procedure selection (e.g. gastric bypass versus gastric band) and cost are not related to study participation. All participants provide informed consent. Details of the LABS-2 pre-operative, operative, and post-operative data collection forms and definitions have been previously reported (2). Participants were approached for participation in LABS-2 between February 1, 2006 and February 17, 2009. By December 1, 2008, 2163 participants had undergone surgery, 1704 of whom were female. Of these women, 1559 completed at least part of the reproductive health survey, 1538 of whom reported their pregnancy history, the minimum requirement for inclusion in the present analysis.

Data Collection

Within 30 days prior to surgery, participants had an in-person research visit. Standardized protocols were used to measure weight and height. Patients self-reported socio-demographics and a history of chronic medical conditions. The self-administered LABS-2 Reproductive Health Survey was given to all female participants. This instrument includes questions regarding pregnancy history (with outcomes recorded as live birth, still birth, miscarriage or other), infertility history, history of polycystic ovary syndrome (PCOS) (“have you ever been told by a health care provider that you have PCOS”), desire and plans for future pregnancy, prior 12-month contraception use and sexual activity, and menopause. The survey was developed specifically for the LABS-2 study, to cover the desired domains of women’s reproductive health. The survey development team consisted of epidemiologists and survey design specialists from the Epidemiology Data Center at the University of Pittsburgh School of Public Health and reproductive health content experts from the University of Pittsburgh School of Medicine. The survey design team piloted the instrument among women at the University of Pittsburgh to assess item clarity. The final survey was approved by the Steering Committee of the LABS study. The survey can be found online at <http://www.edc.gsph.pitt.edu/labs/Public/LABS-1DescriptionPaper/ReproductiveHealthBaseline.pdf>

Women who responded that they had ever “tried to get pregnant” answered questions about infertility and its treatment. In this group, infertility was defined as 12 months of no contraception, regular intercourse with a man and no resulting pregnancy. Only women who recorded any birth control use answered questions about use during sexual activity. Missing data points are reported below each table. Due to competing demands the study protocol did not allow research staff to contact subjects after the study visit in order to complete missing data points on self-administered surveys.

Participants also completed a validated self-administered Weight History Questionnaire which assesses weight at ages 18, 25, and 30. BMI at ages 18, 25 and 30 were calculated using self-reported recalled weights and height as measured at the pre-surgical research visit. Obesity status at each age was defined as a BMI of ≥ 30 kg/m². Study data collection did not ask subjects or surgeons questions regarding motivation for procedure selection.

Statistical analyses

Descriptive statistics were used to report reproductive health characteristics in the entire cohort. The Mantel-Haenszel Chi-Square test for trend was used to analyze the association between age of onset of obesity and reproductive health outcomes among women presumed to have completed their child-bearing years (age 45 and older). Reports of birth control use and desire for future pregnancies were restricted to women under age 45 who did not report natural menopause, surgical menopause, hormone replacement therapy (HRT), hysterectomy and endometrial ablation. In addition, analysis regarding desire for future pregnancies excluded women reporting tubal sterilization, or a husband/live-in partner who had a vasectomy. Based on response distribution, importance of future pregnancy (assessed with a 10 point scale) was recoded as “important” if participants marked 8–10. Logistic regression was used to analyze whether women selecting adjustable gastric band (versus gastric bypass) were more likely to rate future pregnancy as important, controlling for patient age, BMI, number of comorbidities, and previous number of live births. Analyses were conducted with SAS, version 9.1 (SAS Institute Inc, Cary, NC). Significance was defined as $p < .05$.

RESULTS

Table 1 presents sociodemographic characteristics and selected comorbid conditions of the study population. Subjects ranged in age from 18 to 78 years with a mean (SD) of 44.8 ± 11.2 years. The majority was Caucasian (86%), had greater than a HS education (77%); and lived as married (62%). BMI ranged from 33.8–87.3 kg/m^2 with a mean (SD) of $47.2 \pm 7.5 \text{ kg/m}^2$. A third or more of patients had a history of hypertension (54%), sleep apnea (46%), and diabetes (33%), and were currently taking an anti-depressant medication (42%). Thirteen percent had been diagnosed with PCOS, and almost 90% had a least one comorbid condition. Almost three fourths of subjects (74%) had elected to undergo gastric bypass.

Pregnancy history and infertility

A history of pregnancy was reported by 78.7% of women, with 72.5% having at least 1 live birth, 2.0% having at least 1 stillbirth, 25.2% having at least 1 miscarriage, and 14.8% having at least 1 other pregnancy outcome (e.g., elective abortion, ectopic pregnancy, molar pregnancy). Miscarriages comprised 17.4% of pregnancies with reported outcomes (3445 of 3523 pregnancies). The stillbirth rate was 33 per 2501 live births (13.2 stillbirths per 1000 live births).

Of women who never tried to become pregnant ($N=665$), 60.9% had at least one pregnancy, whereas 92.2% of women who had tried to become pregnant ($N=856$) had at least one pregnancy. However, 41.9% of women who tried to become pregnant experienced infertility. Among these women, the median age of first occurrence was 24 years, with 90% reporting first occurrence between 14 and 33 years. After experiencing infertility, 65.0% had at least one pregnancy and 61.4% had a live birth. Just under a third (29.5%) of women who tried to become pregnant sought medical attention for infertility and 16.3% took fertility medication.

Onset of obesity and reproductive health

In order to investigate the relationship between prevalence of reproductive outcomes by age of onset of obesity, analysis was limited to women presumed to have completed their child-bearing years (age 45 and older) who recalled their weight status at ages 18, 25 and 30 ($N=690$). The vast majority (88.4%) gained weight between 18 and 30 years of age, with 56.3% obese or severely obese by age 30. Table 2 shows the frequency of reproductive outcomes by age of onset of obesity. Women who were obese by age 18 were more likely to report a history of PCOS and infertility, and less likely to have ever been pregnant compared to women who became obese later in life.

Birth Control

Among women ages 18–44 who did not report natural/surgical menopause, HRT, hysterectomy or endometrial ablation ($N=660$), 51.8% reported any birth control use in the prior 12 months. Among women who reported any birth control use and sexual activity with a man, 74.3% reported always using birth control. An additional 10.5% reported use most of the time. Methods of birth control used in the last 12 months among women who reported any birth control use and sexual activity with a man are presented in Table 3.

Future pregnancies

Approximately half (48.6%) of women aged 18–44 who did not report natural/surgical menopause, HRT, hysterectomy, endometrial ablation, personal/partner sterilization ($N=574$), reported they would never try to become pregnant after surgery, whereas future pregnancy was important to 30.3%. More women who underwent laparoscopic adjustable gastric banding ($n=121$) rated future pregnancy as important (38.8%) compared to women who underwent

gastric bypass (n= 439; 27.3%). After controlling for patient age, BMI, number of comorbidities, and previous number of live births, women electing laparoscopic adjustable gastric banding have almost a two fold greater odds (OR 1.75; 95% CI: 1.03–2.98) of rating future pregnancy as important compared to women electing gastric bypass (p=.01). When asked about timing of future pregnancies, 32.8% of women who rated future pregnancy as important planned to conceive within 24 months of surgery.

DISCUSSION

This study provides an extensive collection of retrospective reproductive health information in a large cohort of women who are about to undergo weight loss surgery. These data suggest that, in the group as a whole, preoperative reproductive history may be less compromised than what has been described in prior smaller evaluations of bariatric surgery patients (6–12). However, the group of women who reported obesity by age 18 reported a higher frequency of PCOS and infertility than those who became obese later in life. In the current obesity epidemic, more women are obese by age 18 than in previous decades. Providers are likely to care for more obesity-related reproductive health problems in the coming years.

In the overall cohort, 13% of women reported having been diagnosed with PCOS by a healthcare professional, with a higher frequency reported by those reporting obesity by age 18. This appears to be higher than the prevalence estimate of PCOS in the U.S. general population of 7% (15). Prior reports on PCOS prevalence among women with severe obesity range from 12% to 26% (15–16).

Overall the percentages of LABS-2 participants reporting at least one pregnancy (79%) and at least one live birth (74%) appears to be comparable to the general U.S. population. Among female participants in the 2005–2006 National Health and Nutrition Examination Survey Questionnaire, approximately 80% reported at least one pregnancy, and 73% reported at least one live birth (17). LABS participants' reported miscarriage rate (17%) that is in a similar range to the 12% rate reported in a cross sectional population-based survey in the United Kingdom (18) and in the prior reproductive history of a cohort of 200 couples (not selected based on weight) attempting pregnancy (19). This suggests that among most women in LABS-2, the ability to conceive and successfully carry a pregnancy in the years prior to bariatric surgery was not as compromised as might be suspected. Our data show one notable exception to this in the markedly higher reported rate of stillbirths in the overall cohort when compared to U.S. vital statistics, 13.2 versus 6.2 per 1,000 live births (20).

A large proportion of LABS-2 women who had tried to get pregnant reported ever encountering infertility and 8% never achieved any pregnancy. Furthermore, more women who were obese by age 18 had experienced infertility compared to those who attained obesity at older ages. In a population-based sample of U.K. women, much fewer women who had tried to get pregnant failed to achieve any pregnancy (2%). This was a mailed series of reproductive health questionnaires and analysis was limited to respondents ages 40–55 (21). In the U.S., the 2002 National Survey of Family Growth (NSFG) found that 7% of married women ages 15–44 currently were experiencing infertility (no contraception and intercourse for at least 12 months) without resulting pregnancy (22). We did not specifically assess current infertility and we also included older women in this study, thus our numeric result is not directly comparable to NSFG. However, the commonly reported experience of infertility in our study is consistent with findings that obese women are more likely to experience infertility and delay to conception than the general population and normal weight women. These findings are summarized in the American Society for Reproductive Medicine Practice Committee document, "Obesity and reproduction: an educational bulletin" (23). Many women in our cohort reported that they had

sought medical attention for their infertility (30%). This is likely higher than that reported in the U.K. population-based survey described above (16%) and NSFG 2002 (12%) (21, 22).

Approximately half of the women in this cohort were reproductive age. With the increasing number of bariatric procedures done each year in the U.S., women's health practitioners will likely care for a substantial number of women who conceive after bariatric surgery. Hall and colleagues reported that about 10% of women under 40 years old became pregnant within 3 years of bariatric surgery (24). In the LABS-2 cohort, just over half of women age 18–44 reported they may try to conceive post surgery, with nearly one-third reporting that future pregnancy was important.

Gastric bypass, followed by adjustable gastric banding, were the two most commonly performed procedures. This is consistent with procedure choice in the U.S. (25). Gastric bypass produces more rapid and slightly more durable excess weight loss compared to banding procedures (4). However, it presents a greater risk of nutrient malabsorption and need for supplementation based upon bypass of portions of the small intestine. The adjustable nature of gastric banding allows for relaxation of stomach capacity restriction during pregnancy. This study found that women electing adjustable gastric banding had almost a two fold greater odds of rating future pregnancy as important compared to women electing gastric bypass, after controlling for patient age, BMI, number of comorbidities, and previous number of live births. However, we did not inquire as to whether the desire for future pregnancy played a role in procedure selection by the surgeon and/or the subject and it is possible that patient or surgeon preference for a particular procedure drove the decision. Reports on pregnancy outcomes of both adjustable gastric banding and gastric bypass procedures suggest that severely obese women planning pregnancy may experience diminished rates of obstetrical complications after surgery (9, 11, 13). However, larger more detailed studies are needed to better understand how timing of post-surgical pregnancies affects outcomes.

In our cohort, 43% of women had used estrogen-containing contraceptive methods during the prior 12 months. Because of venous thromboembolism risk, many surgeons ask patients to avoid estrogen-containing contraceptives for a designated time period before and after surgery. Therefore, patients at risk for pregnancy who use these methods need a reliable alternative. Interestingly, IUD use was relatively high in our subjects compared to the general population (1% of current contraceptive users) (26). Practitioners may be selecting this as a safe and effective option given the health risk profile of these women.

Several reports have demonstrated improved fertility and/or unanticipated pregnancies after bariatric surgery (6, 27). Early postoperative pregnancy may not be as dangerous as once thought (5); however, failing to prevent unintentional conception during the time of rapid weight loss does not represent optimal care. Thus it is important for practitioners counseling patients about perioperative contraception options to inform patients of the possibility of unintended pregnancy. Just under half of women in the cohort age 18–44 reported that they did not plan future pregnancies. Thus, many women in this age group undergoing bariatric surgery will require effective contraception beyond the perioperative period.

The Reproductive Health Survey was designed for LABS to address specific reproductive health questions raised by the existing literature on obesity, bariatric surgery, and their interaction with women's health. Limitations of this study include the use of a non-validated instrument, which raises concern for measurement error. However, investigators have demonstrated moderate to high reliability and/or validity of questionnaire-based recall of pregnancies, live birth, miscarriage, hysterectomy, oophorectomy, and oral contraceptive use (28, 29). By not assessing sexual activity in all respondents, the survey instrument limited our ability to thoroughly evaluate contraception use among women at risk for pregnancy. The

reproductive health survey was completed as a self-report measure at the end of a long battery of other self-report measures. It is unclear whether missing data points were purposeful (participant choose not to answer particular questions) or due to inattention. Finally, this study does not have a normal weight control group, thus limiting direct comparison to the general population.

Despite the noted limitations, the Reproductive Health Survey adds substantially to the growing body of knowledge that relates female reproductive health and weight loss surgery. Our results contribute important information to women's health providers regarding the reproductive health history and plans of women electing surgical weight loss. This study emphasizes the association between early onset obesity and reproductive problems as well as the need for contraceptive care post surgery. Future annual postoperative survey completion will allow us to assess the impact of weight loss surgery on many of the reproductive issues described in this report. In particular, we will investigate pre to post surgical changes in PCOS treatment, and menstrual cycle interval and duration among premenopausal women, as well as menopausal symptoms among post menopausal women. Among premenopausal women we will also track whether women are trying to become pregnant, their birth control practices, pregnancy incidence and outcome, and fertility treatment utilization.

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Table 1Longitudinal Assessment of Bariatric Surgery-2 (LABS-2) Female Participant Characteristics (N=1538) ^a.

	N (%) ^b
BMI (kg/m ²), mean ± SD, range	47.2 ± 7.5 (range: 33.8–87.3)
Age (years), mean ± SD, range	44.8 ± 11.2 (range: 18–78)
Age categories,	
18–44 years	754 (49.0)
45+ years	784 (51.0)
Race, Missing=2	
White	1314 (85.6)
Black	155 (10.1)
Other	67 (4.3)
Hispanic ethnicity,	84 (5.5)
Highest education level, Missing=7	
Did not complete high school	52 (3.4)
High school diploma or GED	300 (19.6)
Some college or other post-high school education	617 (40.3)
College diploma	331 (21.6)
Graduate or professional degree	231 (15.1)
Current marital status, Missing=7	
Married/Living as married	942 (61.5)
Separated/No longer living as married/	336 (21.9)
Divorced/Widowed	
Never married/never lived as married	253 (16.5)
Health insurance: private, medicare-medicaid, other, Missing=7	1515 (99.0)
Surgical procedure,	
Gastric bypass	1140 (74.1)
Adjustable band	357 (23.2)
Other	41 (2.7)
Comorbidity,	
Hypertension	828 (53.8)
Sleep apnea	707 (46.0)
Antidepressant medication, Missing=3	646 (42.1)
Diabetes	501 (32.6)
Asthma	426 (27.7)
PCOS, Missing=8	201 (13.1)
Prior venous thromboembolism	60 (3.9)
Ischemic heart disease, Missing=1	50 (3.3)
Congestive heart failure	17 (1.1)
≥one of the above co-morbidities, Missing=1	1366 (88.9)

GED, General Educational Development; BMI, body mass index.

^a Participants who proceeded to surgery by November 30, 2008 and completed pregnancy history in the reproductive health survey.

^bN (%) unless otherwise noted.

Table 2

Reproductive history by recalled age of obesity onset in women 45 and older (N=784).

	Total	Recalled Age First Obese, N (%)				P value
		by age 18	ages 19–25	ages 26–30	after age 30	
Overall number, Missing 97	687	133 (19.4)	160 (23.3)	94 (13.7)	300 (43.7)	
Polycystic ovary syndrome, Missing=5	50 (7.3)	19 (14.4)	11 (6.9)	5 (5.4)	15 (5.0)	.002
Ever tried to become pregnant, Missing=9	392 (57.8)	65 (48.1)	89 (56.0)	55 (60.4)	183 (62.0)	.01
Infertility, Missing=28	120 (33.0)	34 (55.7)	33 (39.3)	11 (22.0)	42 (24.9)	<.0001
Ever taken fertility medication	42 (10.7)	13 (20.0)	7 (7.9)	4 (7.3)	18 (9.8)	.12
≥1 pregnancy	593 (86.3)	100 (75.2)	138 (86.3)	79 (84.0)	276 (92.0)	<.0001
≥1 live birth	550 (92.8)	88 (88.0)	132 (95.7)	73 (92.4)	257 (93.1)	.38
≥1 miscarriage	188 (31.7)	35 (35.0)	48 (34.8)	26 (32.9)	79 (28.6)	.14
≥1 stillbirth	22 (3.7)	6 (6.0)	3 (2.2)	2 (2.5)	11 (4.0)	.75

Table 3

Methods of contraception used in the last 12 months before surgery among women 18–44 years old^a reporting any contraception use during intercourse (N=305).

	N (%)
Condom	127 (43.2)
Birth control pills	114 (37.4)
Withdrawal	57 (19.5)
Tubal ligation	47 (16.0)
Vasectomy	40 (13.9)
IUD	38 (13.3)
Injection birth control medication	27 (9.4)
Natural family planning	24 (8.3)
Foams	18 (6.2)
Patch or ring	16 (5.6)
Progestin-only pill	4 (1.4)
Other birth control	3 (1.1)

^aExcluding women who reported natural menopause, surgical menopause, hysterectomy, endometrial ablation, or HRT.