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Original article

# Self-harm hospitalization following bariatric surgery in adolescents and young adults

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SUMMARY

*Background:* While bariatric surgery has demonstrated physical and psychological benefits, a risk of suicide and non-fatal self-harm has also been shown. The aim of this study was to compared the rate of hospitalization for self-harm during a three-year observational follow-up period between adolescents/young adults who underwent bariatric surgery in France in 2013–2014 and two control groups.

*Methods:* All individuals aged 12–25 years old who underwent bariatric surgery in France between January 1st, 2013, and December 31st, 2014, were identified with a validated algorithm from the French national hospital database, and compared to a healthy sample of the general population matched for age and gender. Information relative to hospitalizations, including for self-harm (ICD-10 codes X60-84), were extracted i) between 2008 and the surgery, and ii) for a three-year follow-up period. A second unmatched control group with obesity but no bariatric surgery was also identified. Survival analyses with adjustments for confounding variables were used.

*Results:* In 2013–2014, 1984 youths had bariatric surgery in France. During follow-up, 1.5% were hospitalized for self-harm vs. 0.3% for controls ($p < 0.0001$). After adjustment, subsequent hospitalization for self-harm was associated with bariatric surgery (HR 3.64, 95% CI 1.70–7.81), prior psychiatric disorders (HR 7.76, 95% CI 3.76–16.01), and prior self-harm (HR 4.43, 95% CI 1.75–11.24). When compared to non-operated youths with obesity, bariatric surgery was not associated with self-harm while prior mental disorders and self-harm were. Mortality reached 0.3% after surgery.

*Conclusions:* Bariatric surgery is associated with an increased risk of self-harm, mainly in relation to preexisting psychological conditions. Vigilance and appropriate care are thus warranted in vulnerable individuals.

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## 1. Introduction

In 2016, more than 650 million people over 18 years of age had a body mass index (BMI) of more than 30 kg/m$^2$, which is the threshold for obesity according to the World Health Organization [1]. Obesity is associated with a poorer quality of life [2,3], increased risks of developing medical comorbidities - such as diabetes, cardiovascular diseases and some forms of carcinomas -

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and premature death [4,5]. Obesity and some of its comorbidities are also associated with higher rates of various psychiatric disorders like depression [6–10]. All of these factors contribute to a higher risk of suicidal behavior [11–14]. A higher risk of self-harming behaviors is notably observed in adolescents and young adults with obesity [15–17].

Accordingly, various clinical guidelines recommend bariatric surgery as an option for individuals who have recalcitrant morbid obesity that is refractory to non-operative management [18–21]. Both in youths and adults, bariatric surgery is effective for managing obesity, leading to reductions in excess weight ranging from 60% to 80% within a year of surgery in adults [22,23]. Aside from the main benefits of weight loss, bariatric surgery may also reduce the risk of premature death, and aid with optimal control of diabetic and hypertensive disorders, and resolve obstructive sleep apnea [24–28].

However, several studies have also highlighted an elevated risk of suicide and non-fatal self-harm among patients who have undergone bariatric surgery. In 2013, a systematic review [29] estimated a suicide rate of 4.1/10,000 person-years (95% confidence interval (CI) [3.2, 5.1]/10,000 person-years). A meta-analysis conducted in 2017 [30] showed a pooled prevalence of suicide reaching 0.3% after bariatric surgery. In 2018, Neovius et al. [31] showed that the risk of suicide or non-fatal self-harm following bariatric surgery was 1.78 (95% CI 1.23–2.57) in volunteers included via recruitment campaigns in the mass media or primary healthcare centers. The adjusted hazard ratio (HR) was 3.16 [2.46–4.06] for people with bariatric surgery versus people enrolled in a commercial weight loss program.

There are many hypothesized mechanisms behind this persistent risk of suicide or suicide attempt after bariatric surgery: insufficient weight loss or subsequent weight re-gain; changes in the levels of peripheral released peptides that might affect mood and increase depression and addiction; persistence of eating disorders that result in a sense of disappointment; persistence of pre-exiting psychological disorders [32–37].

The objective of our study was to focus on the risk of self-harm in adolescents and young adults who have undergone bariatric surgery. The peak of self-harming behaviors in female adolescents in France is observed at around 16 years of age [38], and suicide is the second cause of death among adolescents and young adults in many countries including France [39]. The combination of youth and obesity thus results in a group at an increased risk of suicide. However, the literature remains limited in this population. We therefore compared the rate of hospitalization for self-harm during a three-year observational follow-up period between adolescents/young adults who underwent bariatric surgery in France in 2013–2014 and adolescents/young adults from the general population without obesity and bariatric surgery. In our secondary analyses, we compared the same study group to adolescents/young adults with known obesity but without surgical treatment in order to exclude the possibility that obesity and related mental and physical comorbidities were more associated with self-harm occurrence than surgery. Information about hospitalization in the three-year period before surgery was also available for the entire population. Considering that psychological disorders are likely to be the most important risk factors, we hypothesized that rates of self-harm would be 1) higher in adolescents/young adults after bariatric surgery than in the general population, but 2) similar to non-operated adolescents/young adults with obesity.

## 2. Materials and methods

### 2.1. Study design

We conducted a nationwide population-based retrospective cohort study of individuals who underwent bariatric surgery in 2013–2014 in France.

### 2.2. Data extraction

We used data extracted from the French national health data system, which covers 99% of the French population [40]. From birth to death, it collects individual and anonymous data from hospital discharge abstracts (private and public hospitals), healthcare consultations, dispensed drugs (for outpatients only), chronic disease compensation, and specific causes of death in different databases and registries. Hospital diagnoses and chronic diseases are recorded using the International Classification of Diseases 10th edition (ICD-10) codes.

Good-quality data are available starting in 2008, so the background period for included patients spanned from 2008 to the index hospitalization for bariatric surgery, and the follow-up period spanned from the index hospitalization to December 31st, 2017.

### 2.3. Population

All individuals aged 12–25 years old who underwent bariatric surgery in France between January 1st, 2013 and December 31st, 2014 were identified on hospital discharge abstracts according to an algorithm [41] established by the REDSIAM network-working group dedicated to endocrine disorders. REDSIAM is a French expert network [42] set up to promote the collaboration of teams working on the French national information system and aiming to develop and validate algorithms used to identify specific diseases.

The exposed group comprised adolescents/young adults for whom the hospital discharge abstract included both a diagnostic code for obesity (E66.0; E66.1; E66.2; E66.8; E66.9) as a main, associated or related diagnosis, and a bariatric surgery procedure (HFCC003; HFCA001; HFMC007; HFMA009; HFFC018; HFFA011; HFFC004; HFFA001; HGCC027; HGCA009). We excluded individuals for whom hospitalization data or a chronic disease registry identified a digestive cancer (C15 to C26.9) before or during the index hospitalization, and cases of acute or chronic gastric, duodenal, peptic or gastrojejunal ulcer (K25 to K28). The hospitalization for bariatric surgery in 2013 or 2014 was considered as the index hospitalization. Patients who died before or during the index hospitalization were excluded (Fig. 1).

The main non-exposed control group was selected from a two-stage sample design. First, a sampling of 5% of the French 12-25 year-old population recorded in the French national health data system was drawn. We excluded individuals with hospitalization data mentioning obesity or bariatric surgery between 2008 and 2012. Controls were then individually matched (1:3) to exposed individuals according to age and gender. We considered that the control group was included in the study on January 1st, 2013.

A second non-exposed control group was identified from discharge abstracts including a code for obesity as a main, associated or related diagnosis, and excluding those with a bariatric surgery procedure.

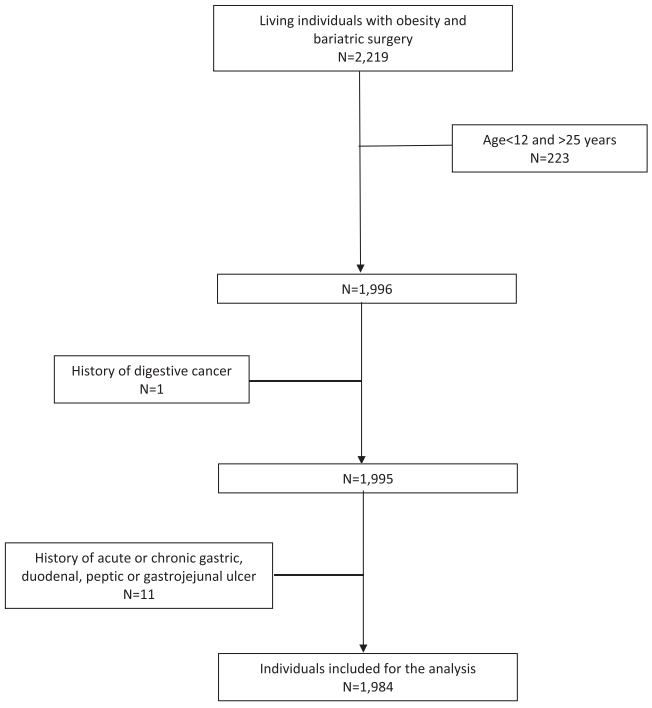



**Fig. 1.** Study flow diagram.

This study was approved by the French national committee for data protection (registration number DR-2019-021). Individual written consent was not required.

### 2.4. Outcomes

The primary outcome was any hospitalization for self-harm identified with at least one ICD-10 code X60 to X84 filled in a hospital discharge abstract between the index hospitalization and December 31st, 2017 (i.e. 3 years of follow-up).

### 2.5. Confounding variables

The following variables were assessed for all individuals included in the study: age at index hospitalization (the following equally distributed age categories were defined: 14–21, 22–23, 24–25 years); sex; a history of hospitalization since 2008 for: self-harm, physical diseases according the main category systems (all chapters of ICD-10), psychiatric disorders including eating disorders (F10–F98 ICD-10 codes); and a history of reimbursed psychotropic drugs (according to the Anatomical Therapeutic Chemical (ATC) classification system N05, N06, N07B). During the follow-up period, the following information was extracted: date of death, cause of death when possible (data only available until December 31st, 2015), a hospitalization for psychiatric or somatic disorders (including eating disorders), means used for self-harm when it occurred, and psychotropic drug reimbursement.

### 2.6. Statistical analysis

Individual characteristics, physical and psychiatric comorbidities, and medication prescribed are presented as proportions. The comparison of variables between adolescents/young adults with and without bariatric surgery was first performed using Pearson $\chi 2$ tests or Fisher exact tests, as appropriate. Incidence rates of hospitalization for self-harm were compared between the two groups each month during the first year before and after the bariatric surgery, then at two and three years post-surgery.

Survival analyses were performed using a Cox proportional hazards regression model to explore the association between hospitalization for bariatric surgery and subsequent hospitalization for self-harm, after adjustment for confounding variables (age, sex, previous or subsequent hospitalization for eating disorders, self-harm, physical or psychiatric diseases, and psychotropic drug reimbursement). We followed individuals until hospitalization for self-harm, death or the end of the follow-up period, whichever came first. The results are reported as adjusted hazard ratios (HR) and 95% confidence intervals (95%CI).

A second similar set of analyses was performed, comparing the exposed population with youths with obesity but without bariatric surgery.

Statistical significance was set at a p-value of 0.05 for all analyses.

SAS 9.4 software was used for all data analyses.

## 3. Results

### 3.1. Population

In 2013–2014, 1984 adolescents/young adults had bariatric surgery in France (Table 1). The youngest was 14 years-old, and 37 individuals were 17 or younger. There were 1817 (91.6%) women. The surgical procedures were: 65% sleeve gastrectomy, 18% gastric bypass, 17% gastroplasty ring, and less than 1% of other surgical techniques. After matching, the two groups in the main analysis were comparable for age and sex.

Medical history prior to the index hospitalization is presented in Tables 1 and 2. Higher rates of somatic and psychiatric disorders, both in the background and follow-up periods, are found among the cases as compared to the general population control group, and 2.4% vs. 0.7%, respectively, had a personal history of hospitalized self-harm.

### 3.2. Self-harm during follow-up

During follow-up, individuals who had undergone bariatric surgery were more likely to have been hospitalized for self-harm than the sample from the general population (1.5% vs. 0.3%; $p < 0.0001$) (Table 1). The most commonly used means for self-harm were medication intoxications (93% vs. 88%). Median duration between surgery and first hospitalization for self-harm was 319 days [min = 7-max = 981]. Among the 37 individuals younger than 18 years who had bariatric surgery, one had a hospitalization for self-harm. Among those with bariatric surgery who self-harmed during follow-up, 25 (86%) had no history of hospitalization for self-harm in the background period.

In univariate analysis, bariatric surgery was associated with an increased risk of subsequent hospitalization for self-harm (HR = 5.16, 95% CI 2.83–9.38). In multivariate analysis (Table 3), bariatric surgery, prior psychiatric disorders, prior self-harm - but not prior eating disorder or prior somatic comorbidities - were significant risk factors for subsequent hospitalization for self-harm. Because of their epidemiological importance, we added age and gender in the model, and the results remained similar.

In the population who underwent bariatric surgery, the self-harm rate one year before and after bariatric surgery increased from 33 to 49 cases per 10,000 patient-years. To evaluate the temporal association between bariatric surgery and self-harming behavior, we compared the occurrence of hospitalization for self-harm for each month in the year before and the year after

**Table 1**
Sociodemographic characteristics and variables of interest in adolescents/young adults who underwent bariatric surgery and adolescents/young adults from the general population.

| | With Bariatric surgery (n = 1984) | | Without Bariatric surgery (n = 5952) | | p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Age (years) | | | | | |
| 14-21 | 603 | 30.4 | 1809 | 30.4 | 1 |
| 22-23 | 687 | 34.6 | 2061 | 34.6 | |
| 24-25 | 694 | 35.0 | 2082 | 35.0 | |
| Sex | | | | | |
| Male | 167 | 8.4 | 501 | 8.4 | 1 |
| Female | 1817 | 91.6 | 5451 | 91.6 | |
| Death | 5 | 0.3 | 4 | 0.07 | 0.04 |
| Self-harm prior to inclusion | 47 | 2.4 | 43 | 0.7 | <0.0001 |
| Self-harm after inclusion | 29 | 1.5 | 17 | 0.3 | <0.0001 |
| Self-harm methods among self-harm hospitalization | (n = 29) | | (n = 17) | | |
| Intoxication | 27 | 93.1 | 15 | 88.2 | |
| Other self-harm methods | 4 | 13.8 | 4 | 23.5 | |

**Table 2**
Prevalence of somatic and mental disorders during the background period and the follow-up period in youths with bariatric surgery and youths from the general population.

| | Background period | | | | Follow-up period | | | |
|---|---|---|---|---|---|---|---|---|
| | With Bariatric surgery (n = 1924) | | Without Bariatric surgery (n = 5952) | | With Bariatric surgery (n = 1924) | | Without Bariatric surgery (n = 5952) | |
| | n | % | n | % | n[a] | % | n[a] | % |
| **Physical disorders**[c] | **1534** | **77.3** | **878** | **14.8** | **1271** | **64.1** | **1038** | **2.7** |
| Hypokaliemia | 18 | 0.9 | 3 | 0.02 | 34 | 1.7 | 1 | 0.02 |
| Type 2 diabetes | 99 | 5.0 | 11 | 0.1 | 36 | 1.8 | 2 | 0.03 |
| Infectious and parasitic diseases | 522 | 26.3 | 83 | 1.9 | 228 | 11.5 | 100 | 1.7 |
| Nervous system diseases | 293 | 14.8 | 39 | 0.7 | 137 | 6.9 | 40 | 0.7 |
| Circulatory system diseases | 204 | 10.3 | 32 | 0.5 | 98 | 4.9 | 27 | 0.5 |
| Respiratory system diseases | 247 | 12.5 | 84 | 1.4 | 112 | 5.7 | 50 | 0.8 |
| Digestive system diseases | 1120 | 56.5 | 439 | 7.4 | 558 | 28.1 | 188 | 3.2 |
| Musculoskeletal system diseases | 196 | 9.9 | 95 | 1.6 | 106 | 5.3 | 48 | 0.8 |
| Injury, poisoning or other consequences of external causes[b] | 281 | 14.12 | 143 | 2.4 | 291 | 14.7 | 91 | 1.5 |
| **Mental disorders** | **355** | **17.9** | **127** | **2.1** | **210** | **10.6** | **114** | **1.9** |
| Psychoactive substance misuse | 249 | 12.6 | 60 | 1.0 | 124 | 6.3 | 66 | 1.1 |
| Schizophrenia | 10 | 0.5 | 9 | 0.2 | 8 | 0.4 | 11 | 0.2 |
| Bipolar affective disorder | 5 | 0.3 | 2 | 0.03 | 4 | 0.2 | 5 | 0.1 |
| Depressive disorders | 72 | 3.6 | 32 | 0.5 | 58 | 2.9 | 27 | 0.5 |
| Anxiety disorders (without obsessive-compulsive disorder) | 54 | 2.7 | 32 | 0.5 | 59 | 3.0 | 29 | 0.5 |
| Adult personality and behavior disorders | 40 | 2.0 | 17 | 0.3 | 29 | 1.5 | 19 | 0.3 |
| Eating disorders | 11 | 0.6 | 6 | 0.1 | 7 | 0.4 | 12 | 0.2 |
| Other mental disorders | 8 | 0.4 | 9 | 0.2 | 5 | 0.3 | 11 | 0.2 |

[a] n in the follow-up period represents new hospitalizations.
[b] Not including self-harm.
[c] Including infectious and parasitic diseases; neoplasms; diseases of the blood and blood-forming organs; endocrine, nutritional and metabolic diseases; diseases of the nervous system; diseases of the eye; diseases of the ear; diseases of the circulatory system; diseases of the respiratory system; diseases of the digestive system; diseases of the skin; diseases of the musculoskeletal system; diseases of the genitourinary system; pregnancy, childbirth; certain conditions originating in the perinatal period; congenital malformations, deformations and chromosomal abnormalities; Injury, poisoning and certain other consequences of external causes; external causes of morbidity and mortality.

bariatric surgery, and then at two and three years. Within six months after bariatric surgery, the incidence rate remained constant at 0.5 self-harm cases for 1000 youths with bariatric surgery. For the first year, the shape of the curve was not very different before and after the surgery (Fig. 2). We observed nearly the same number of self-harm cases during the second and third years before and after surgery: eight individuals for the second year before surgery, and seven for the second year after surgery; five individuals for the third year both before and after.

Otherwise, of the 29 individuals who were hospitalized for self-harm during the three years of follow-up, only two individuals had been already hospitalized for self-harm in the year prior to the surgery (Supplementary Fig. 1).

### 3.3. Comparison of patients with bariatric surgery who self-harmed or not during follow-up

The results are presented in Supplementary Table 1. Individuals who self-harmed during follow-up had higher rates of prior self-harm and of most psychiatric disorders, both during the background and follow-up periods. In multivariate analyses, those who self-harmed had higher rates of depressive disorders

**Table 3**
Variables associated with the risk of self-harm during the follow-up period.

| | HR | IC |
|---|---|---|
| Bariatric surgery (ref = 0) | 3.64 | 1.70–7.81 |
| Prior physical disorder (ref = 0) | 0.49 | 0.23–1.05 |
| Prior mental disorder (excluding eating disorder) (ref = 0) | 7.76 | 3.76–16.01 |
| Prior eating disorder (ref = 0) | 2.42 | 0.55–10.67 |
| Prior self-harm (ref = 0) | 4.43 | 1.75–11.24 |

(HR = 48.91 (21.10–113.34)) and psychotropic medication prescribed (HR = 3.58 (1.34–9.56)).

### 3.4. Mortality during follow-up

During the follow-up period (until 31st December, 2016), five deaths occurred in the bariatric surgery group (0.3%), while four deaths occurred in the control group (0.07%) (Table 1). Causes of deaths cannot be specified due to the small number of individuals.

### 3.5. Psychiatric and somatic disorders during follow-up

Rates of new psychiatric and somatic disorders during follow-up are reported in the right side of Table 2. The rates for both psychiatric and physical disorders were superior in the bariatric surgery group compared to the sample from the general population. During follow-up, five women were hospitalized for anorexia and two women were hospitalized for bulimia nervosa, although they had no hospitalization for these conditions in the background period.

### 3.6. Secondary analyses: comparison with the control group of youths with obesity but without bariatric surgery

Results are presented in Table 4. We identified 2060 adolescents/young adults with obesity and no bariatric surgery, which did not allow us to do any age and sex matching. The age and sex of the groups therefore differed. The group of adolescents/young adults without bariatric surgery included more people between 14 and 21 years of age (53.2 vs. 30.4%), and more men (28.5 vs. 8.4%) than the group of youths with bariatric surgery. We found no significant between-group differences in terms of past history of self-harm (2.5 vs. 2.4%), or self-harm (1.1 vs. 1.5%) and mortality (0.25 vs 0.25%) during follow-up. Bariatric surgery was not significantly associated with a subsequent hospitalization for self-harm, either in univariate analysis (HR = 1.31, 95% CI 0.76–2.26) or multivariate analysis, whereas prior mental disorders and prior self-harm were (Table 5).

## 4. Discussion

This nationwide study examined the risk of hospitalization for self-harm after bariatric surgery in a large sample of adolescents and young adults. Overall, 1.5% of patients who underwent bariatric surgery were hospitalized for self-harm during the three-year follow-up period. This is higher than in the sample of the general population matched for age and gender (0.2%). When comparing these two groups, bariatric surgery, prior mental disorders, and prior self-harm were significant risk factors for subsequent hospitalization for self-harm (with prior mental disorders showing an HR twice the one for bariatric surgery). However, when individuals with obesity and bariatric surgery were compared to unmatched individuals with obesity and no bariatric surgery (1.1% being hospitalized for self-harm during the same follow-up period), surgery was no longer a risk factor. On the contrary, prior mental disorders and prior self-harm remained significant risk factors with high HR (8.3 and 4.8, respectively).

Several studies have investigated the risk of self-harm and/or suicide in adults who undergo bariatric surgery. Throughout adulthood, the risk of suicide after bariatric surgery increases three-to four-fold [31,43,44]. This risk was also found to be increased when comparing to controls with obesity. For instance, a study from 2019 reported an increased risk of self-harm/suicide in adults with obesity (37–60 years, mean age 47.2 years for the surgery group (+/− 5.9) and 48.7 years for the control group (+/− 6.3)) after bariatric surgery as compared with the control group, after adjustment (HR = 1.98, 95% CI 1.34–2.93).

A personal history of self-harm and mental illness was also associated with self-harm/suicide [45]. A study conducted in Denmark between 1997 and 2013 found an increased risk of intentional self-harm in operated obese patients compared to non-operated patients with obesity, after controlling for age (mean age 45.87 years, +/− 10.37) and gender (HR 3.23, 95% CI 1.93–5.40 in

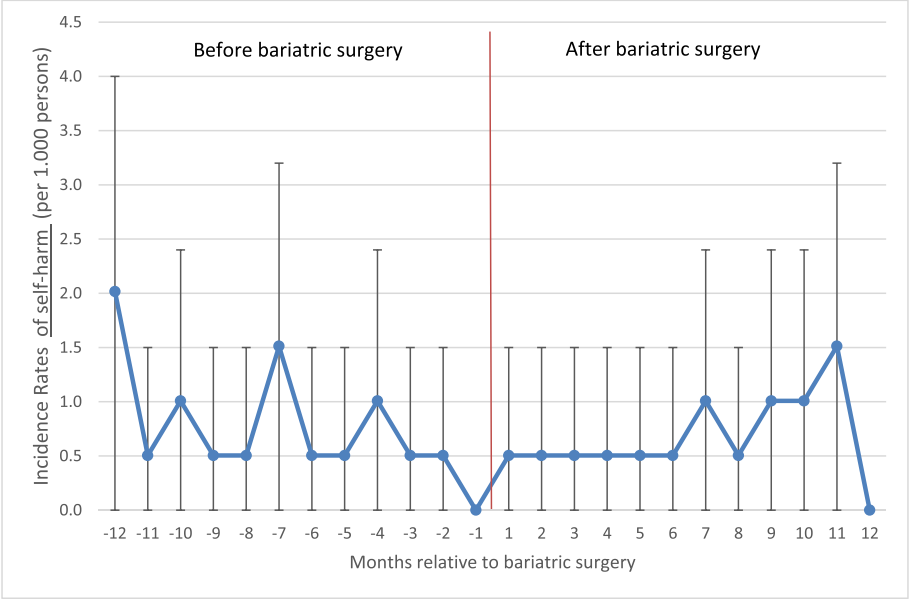



**Fig. 2.** Incidence rate of self-harm one year before and after bariatric surgery.

**Table 4**
Sociodemographic characteristics and variables of interest in adolescents/young adults with bariatric surgery and adolescents/young adults with obesity and no bariatric surgery.

| | With bariatric surgery (n = 1984) | | Obesity, without bariatric surgery (n = 2060) | | p-value |
|---|---|---|---|---|---|
| | n | % | n | % | |
| Age (years) | | | | | |
| 14-21 | 603 | 30.4 | 1095 | 53.2 | <0.0001 |
| 22-23 | 687 | 34.6 | 399 | 19.4 | |
| 24-25 | 694 | 35.0 | 566 | 27.5 | |
| Sex | | | | | |
| Male | 167 | 8.4 | 586 | 28.5 | <0.0001 |
| Female | 1817 | 91.6 | 1474 | 71.6 | |
| Death | 5 | 0.25 | 5 | 0.24 | 1 |
| Prior self-harm | 47 | 2.4 | 52 | 2.5 | 0.75 |
| Self-harm after inclusion | 29 | 1.5 | 23 | 1.1 | 0.40 |
| Self-harm methods among self-harm hospitalization | (n = 29) | | (n = 23) | | |
| Intoxication | 27 | 93.1 | 20 | 87.0 | 0.30 |
| Other self-harm methods | 4 | 13.8 | 8 | 34.8 | |

**Table 5**
Variables associated with a risk of self-harm during the follow-up period, between adolescents/young adults with bariatric surgery and adolescents/young adults with obesity, without bariatric surgery.

| | HR | IC |
|---|---|---|
| Bariatric surgery (ref = 0) | 1.31 | 0.71–2.42 |
| Prior physical disorders (ref = 0) | 0.84 | 0.43–1.64 |
| Prior mental disorder (excluding eating disorder) (ref = 0) | 8.34 | 4.49–15.48 |
| Prior eating disorder (ref = 0) | 2.12 | 0.50–9.10 |
| Prior self-harm (ref = 0) | 4.78 | 2.24–10.21 |

the single-event analysis) [43]. To our knowledge, few studies have examined young people. Our results are consistent with a study published in 2020 comparing adolescents aged 13–18 years with obesity who underwent bariatric surgery (mean age 17 years ± 1.4) or not (mean age 16 years ± 1.4), which did not find an association between bariatric surgery and suicidal behavior [46].

In our study, there was a low incidence rate of self-harm in the six-month period after surgery. This result is consistent with previous studies that reported a decrease in depressive symptoms in the first year after bariatric surgery and an improvement in quality of life from one to five years following bariatric surgery [47–49]. Many patients may, therefore, experience benefits from surgery in terms of psychological wellbeing. However, persistent mental disorders may contribute to the ongoing risk of self-harm in a subgroup of patients. In our study, and in spite of their young age, 17.9% of patients who underwent surgery had a history of a mental disorder prior to surgery, mostly substance misuse (12.6%), depressive disorders (3.6%), anxiety disorders (2.7%) and personality disorders (2.0%). It is also interesting to note that some patients seemed to develop “de novo” eating disorders after surgery, including 5 women developing anorexia nervosa and 2 women bulimia nervosa, two disorders that increase the risk of self-harm [50]. Although only 13.8% of those who attempted suicide during follow-up had a previous hospitalization for self-harm, prior self-harm was also an independent risk factor of subsequent self-harm. Prior self-harm is a recognized risk factor of subsequent suicide attempt and suicide death [51]. Our study therefore highlights the preeminent role of mental disorders and prior self-harm in the risk of self-harm after surgery.

The professionals involved in the follow-up of young patients after surgery should be aware of this observation. It is obviously important to collect information about prior mental disorders for surgical decision-making. The balance between the benefit and risk of surgery in those with a psychiatric history should be carefully weighed, and if clinicians decide to proceed with surgery, adequate mental health care should be insured during follow-up.

One of the strengths of this study is the exhaustive collection of data for all adolescents/young adults who underwent bariatric surgery for obesity in France over a period of two years. Bariatric surgery being costly, it seems unlikely that this act is under-coded by surgery departments. Another strength was our ability to collect information over the five to seven years prior to study inclusion and the three years after inclusion. Moreover, we were able to constitute both an age- and sex-matched control group from a 5% sample of the general population of young people and a second control group including young people with obesity and no surgery.

We acknowledge that our study also has several limitations. First, some somatic and psychiatric comorbidities were diagnosed based on hospital abstracts only, and so the quality of these diagnoses cannot be guaranteed. Moreover, less severe disorders that did not require hospitalization were missing. Second, we only studied self-harm resulting in hospitalization, which does not allow us to conclude on all self-harming behaviors, which leads to an underestimation of the phenomenon. One French study from a phone survey in a representative sample of the general population showed that 40% of declared self-harm were not followed by presentation to a hospital [52]. However, it is likely that the most severe suicidal acts result in hospital admission. Finally, some relevant data are not available in the health system, including post-surgery BMI or quality of life, for instance.

In summary, in adolescents/young adults who undergo bariatric surgery, prior psychiatric conditions seem to contribute to an increased risk of self-harm after surgery more than the surgery itself or the related consequences.

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Ministry of Health, DREES, 2018.

## Data share statement

Data described in the manuscript will not be made available. Our department's use of these sensitive data was approved by the “Expert Committee for research, studies and evaluations in the health field” (CEREES) and the “National Committee for data protection” (CNIL). Data used in this study are only available for researchers who meet the criteria for access from the French National Health Insurance Fund (training that provides personal accreditation, approval of the protocol by required authorities

(CEREES and CNIL)) according to the law “Décret n° 2016–1872 du 26 décembre 2016 modifiant le décret n° 2005-1309 du 20 octobre 2005 pris pour l'application de la loi n° 78-17 du 6 janvier 1978 relative à l'informatique, aux fichiers et aux libertés”, https://www.legifrance.gouv.fr/eli/decret/2016/12/26/2016-1872/jo/texte.

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## Conflict of interest

No authors have any conflict of interest to disclose.

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KG, FJ and CQ were involved in the conception and design of the study. CQ was the coordinator of the study. KG and CQ were responsible for the data collection. KG, FJ and CQ wrote the first draft. KG was in charge of the analysis. KG and CQ accessed and verified the data. All authors were involved in the interpretation, critically reviewed the first draft, and approved the final version.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnu.2021.11.034.

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