Early Evolution of Alcohol Use and Drinking Motives After Bariatric Surgery and Associated Factors: a Prospective Cohort Study

Abstract

Background: Research indicates the prevalence of alcohol use disorder (AUD) increases following bariatric surgery. However, the evolution of alcohol drinking motives over time and the predictors of increased alcohol use post-surgery remain unclear. **Objectives:** This study examined changes in alcohol consumption and drinking motives during the first six months after bariatric surgery, as well as psychological factors associated with increased postoperative alcohol use. **Setting:** The research was conducted across four Belgian hospitals. **Methods:** A prospective cohort study was carried out. Of the 298 participants who completed baseline questionnaires, 252 (84.6%) completed them six months post-surgery. **Results:** Six months post-surgery, the prevalence of probable AUD (7.9% versus 3.2%, $p < .01$), and the total AUDIT scores declined ($z = -6.28$; $p < .001$) in the full sample. However, a subgroup (9.1%) reported increased alcohol intake ($z = -4.23$; $p < .001$) and heightened coping-related drinking motives ($z = -2.82$; $p < .01$), a pattern not observed in the overall sample. Preoperative psychological factors (i.e., emotional regulation, experiential avoidance, emotional eating) were not significantly associated with postoperative alcohol use. However, the group with increased intake showed higher postoperative anxiety than others ($H(2) = 7.12$; $p = .03$), and was the only one in which anxiety scores did not decrease postoperatively ($z = -0.89$, $p = .37$). **Conclusions:** By six months post-surgery, a subset of individuals demonstrated increased alcohol use, coping drinking motives, and persistent high anxiety. The six-month postoperative period may represent a key window for implementing interventions to prevent AUD development.

Key words: bariatric surgery, alcohol use, drinking motives, risk factors

Highlights:

- 9.1% of participants increased their alcohol consumption as early as 6 months after bariatric surgery
- These individuals exhibited heightened coping-related drinking motives post-surgery
- Only postoperative anxiety and persistence of high anxiety levels from before to after surgery were associated with increased alcohol use

Introduction

Despite its benefits for physical and mental health, bariatric surgery is also associated with an increased prevalence of alcohol use disorder (AUD) [1-3]. Initial research indicated that this rise was primarily observed after Roux-en-Y Gastric Bypass (RYGB). However, more recent studies also reveal an elevated risk of AUD following sleeve gastrectomy (SG) [4-7].

In terms of timing, the prevalence remains stable in the first year following surgery but generally rises one to two years later [8-10]. Few studies have provided detailed data on changes in alcohol consumption during the early postoperative months. Often based on small sample sizes and non-validated assessment tools, existing evidence suggests either a decrease or no significant change in drinking behavior during this early phase [4, 11-13].

Nonetheless, the fact that AUD rates increase one to two years after surgery suggests that changes in drinking behavior may begin earlier. It is plausible that some individuals start increasing their alcohol use shortly after the procedure, reaching problematic levels by one- to two-year post-surgery. This underscores the need to further investigate alcohol use (not only AUD) during the early months following the operation.

Beyond the timing of increased alcohol use, another important yet less studied aspect involves the motives behind it. Previous studies have primarily focused on AUD prevalence changes. To our knowledge, no quantitative research has explored the evolution of the reasons behind alcohol use, or drinking motives, after surgery. Among alcohol drinking motives, those related to coping (i.e., to alleviate negative affects, e.g., *"to forget about your problems"*) and enhancement (i.e., to enhance positive affect, e.g., *"to get high"*) [14] [p. 903] are the strongest predictors of long-term problematic alcohol use [15-17]. Qualitative studies suggest these motives may increase for certain individuals post-surgery, as several participants in these studies reported drinking more post-surgery as a way to cope with difficulties or as a source

of pleasure [18-19]. This highlights the importance of examining how underlying motivations for alcohol use may change following surgery, rather than focusing solely on consumption patterns.

Regarding psychological risk factors for post-operative AUD, research has generally focused on pre-operative binge eating, food addiction and depressive symptoms [e.g., 4, 8, 20-23]. Most found no association between these eating behaviors and postoperative AUD, and contradictory results were observed regarding the effects of depressive symptomatology [9, 10, 24, 25]. Some qualitative studies suggest pre- and post-operative factors beyond these variables may contribute to AUD [18, 19].

Possible *preoperative* risk factors include processes related to emotional functioning. As previously noted, participants in qualitative studies often reported turning to alcohol post-surgery to manage difficulties or avoid certain thoughts or feelings, with alcohol sometimes replacing food in this role. This suggests a potential link between increased alcohol use after surgery and preoperative emotion regulation deficits (i.e., difficulties in effectively managing and modulating emotions), high levels of experiential avoidance (i.e., unwillingness to engage with internal experiences, such as thoughts or emotions and strategies to avoid them), and emotional eating [18, 19, 26, 27].

Postoperative risk factors may include anxiety or depression after surgery, as many participants in qualitative research reported their increased drinking occurred in response to post-surgical stress, anxiety, and depression [18, 19]. Further quantitative research is needed to determine whether these variables are indeed associated with increased alcohol consumption after bariatric surgery.

In light of these findings, the present research aimed to explore the evolution of alcohol consumption and drinking motives in the first six months after bariatric surgery, as well as the

psychological factors associated with increased postoperative consumption. Four hypotheses were formulated based on previous qualitative and quantitative research.

Hypothesis 1: The prevalence of AUD will remain stable during the initial months following the operation for the entire sample.

Hypothesis 2: Enhancement and coping alcohol drinking motives will increase after surgery for the whole sample.

Hypothesis 3: Even though the AUD prevalence remains unchanged six months post-surgery, some participants will increase their consumption in the months following the operation.

Hypothesis 4: Individuals who increase their consumption after the procedure will show higher baseline scores for emotional eating, emotion regulation deficits, and experiential avoidance, as well as higher levels of depression and/or anxiety following surgery compared to the other participants.

Materials and methods

Design

This study is part of an ongoing longitudinal research that investigates changes in alcohol use and drinking motives following surgery, as well as associated factors. It is a multicenter study conducted across four hospitals in Belgium, featuring five measurement time points: before surgery, and then 6-, 12-, 18-, and 24-months post-surgery. At each time point, participants are asked to complete online questionnaires. The research protocol has been approved by the ethics committee of each hospital, and informed consent was obtained from all participants. The protocol for this study has been registered in ClinicalTrials.gov

(NCT06194175). This is the phase one report of the study, presenting results from before to six months after surgery.

Participants

Participants were recruited from four hospitals between May 30, 2023, and May 30, 2024. Surgeons at these hospitals invited individuals whose surgical candidacy had been accepted to take part in the study. The inclusion criteria required participants to be at least 18 years old, have their surgical candidacy approved, have a good understanding of French, and have an internet access to complete the questionnaires.

To maximize response rates at the six-month follow-up, participants received an initial invitation by email, followed by up to two reminder emails spaced three days apart. These reminders emphasized the brevity of the questionnaire (approximately seven minutes), the anonymity of responses, and the importance of their contribution to the continuation of the research.

Measures

Data collection was conducted independently from the preoperative psychological assessment. Participants' responses were anonymous at each time point. The questionnaires were completed online through a secure system provided by [name of the university]. A total of 13 questionnaires were used in this research; however, participants only answered a subset of these before and six months after the operation. For clarity, only the questionnaires that are essential for understanding the current results are presented here (see Table 1 for the complete list of questionnaires). The internal reliability of the scales, both before and after surgery, was assessed using McDonald's omega coefficient (ω), with values of 0.70 or higher considered as satisfactory [28].

The Alcohol Use Disorders Identification Test (AUDIT) [29, 30] was employed to evaluate alcohol consumption and detect potential AUD over the past 12 months. It includes 10 items to which the participant responds using a five-point Likert scale for the first eight items and a three-point scale for the last two. The total score ranges from 0 to 40, with a score of 8 or higher suggesting the participant may present an AUD. Throughout this manuscript, the term AUD refers to a possible or probable AUD, as indicated by screening scores, and not to a clinical diagnosis. For the administration at six months post-surgery, the original items of the AUDIT were left unchanged, but the questionnaire instruction was modified to specify that participants should respond to items based on their alcohol use during the last six months, and not the last year. The internal consistency of the AUDIT was satisfactory, with an omega coefficient of 0.79 at baseline and 0.83 at six months post-surgery.

The Cut-down Annoyed Guilty Eye-opener (CAGE) [31, 32] was used to identify individuals who may have experienced AUD at some point in their lives. It consists of four items to which participants respond with "yes" or "no." Two or more affirmative responses indicate a possible history of, or current problematic drinking. In this study, the CAGE questionnaire was administered alongside the AUDIT to differentiate between new cases of AUD and postoperative relapses. Specifically, some participants may have had alcohol-related issues earlier in their life (as indicated by a CAGE score ≥ 2) but not within the past year (as indicated by an AUDIT score < 8). The combined use of both tools allowed for the identification of individuals with a potential lifetime history of AUD, even if they appeared to have no alcohol-related problems in the year prior to surgery. The internal consistency of the CAGE was good, with an omega coefficient of 0.86.

The Drinking Motive Questionnaire Revised Short Form (DMQ-R SF) [14, 33] was used to assess drinking motives. This questionnaire assesses four types of drinking motives over the past 12 months: 1) enhancement (e.g., *"to have fun and to get drunk"*), 2) social (e.g., *"to*

better enjoy social gatherings"), 3) conformity (e.g., *"not to feel left out of the group"*), and 4) coping motives (e.g., *"to alleviate personal problems and worries"*) [14] (pp. 899-900). It consists of 12 items, three for each type of motivation. Scores for each type of drinking motivation range from 3 to 9, with higher scores indicating higher levels of drinking motivations. As with the AUDIT, the questionnaire instructions were changed for the postoperative assessment, inviting participants to answer questions based on their drinking motives over the past six months. Except for the enhancement subscale, internal consistency for each subscale was generally satisfactory to excellent at both baseline and follow-up (enhancement [ω = .74 at baseline, ω = .61 post-surgery], social [ω = .92 at baseline, ω = .89 post-surgery], conformity [ω = .82 at baseline, ω = .70 post-surgery], and coping [ω = .88 at baseline, ω = .90 post-surgery]).

The Hospital Anxiety and Depression Scale (HADS) [34, 35] was employed to assess depression and anxiety symptoms over the past week. The scale comprises 14 items, divided equally between two subscales: seven items assess anxiety (HADS-A) and seven assess depression (HADS-D). Each item is rated on a 4-point Likert scale ranging from 0 to 3, yielding total scores between 0 and 42. A score of 11 or higher indicates significant and probable symptomatology [28]. Except for the post-surgery depression subscale, internal consistency for each subscale was acceptable (depression [ω = .71 at baseline, ω = .64 post-surgery], and anxiety [ω = .73 at baseline, ω = .74 post-surgery]).

Other measures were utilized, but for the sake of conciseness, they will only be briefly mentioned. Participants self-reported their weight, height, and sociodemographic variables. The emotional eating subscale of the Dutch Eating Behavior Questionnaire (13 items) was employed to assess emotional eating, with scores ranging from 1 to 5 and higher scores indicating more severe emotional eating problems [36, 37]. The Difficulties in Emotion Regulation Scale (36 items) was used to examine difficulties in emotional regulation, with the

total score ranging from 36 to 180, and higher scores indicating more severe deficits in emotional regulation [38, 39]. The Brief Experiential Avoidance Questionnaire (14 items) assessed experiential avoidance, with scores ranging from 14 to 84, and higher scores indicating higher levels of experiential avoidance [40, 41].

Analysis

Participants' characteristics and scores on various scales were summarized using frequencies, medians, minimum and maximum values, means, and standard deviations. Binomial tests were conducted to compare the proportion of some behaviors (e.g., proportion of participants with AUD) before and after the procedure.

Changes in alcohol consumption and drinking motives from before to after surgery were analyzed with Wilcoxon rank tests, as the data did not follow a normal distribution. However, the means and standard deviations on the AUDIT and DMQ-R SF scores before and after surgery were still presented alongside the medians and minimum and maximum values, as these estimators enabled a clearer visualization of the evolution of alcohol use and drinking motives over time. Subgroup analyses were conducted separately for participants who underwent RYGB and those who underwent SG, in order to examine whether AUDIT scores and drinking motives changed after both procedures.

Alcohol evolution groups were developed based on the difference in participants' total AUDIT scores between baseline and the six-month follow-up. These scores were calculated by subtracting the pre-surgery AUDIT scores from those obtained six months post-operation. A strict criterion was applied, whereby only participants whose total AUDIT score remained exactly the same were classified as "stable" alcohol use. Any positive or negative change in score, even by a single point, led to classification in the "increased" or "decreased" alcohol use groups, respectively. This approach was chosen to capture even minimal variations in

alcohol use behavior, which may be clinically meaningful in a post-bariatric context, as alcohol's pharmacokinetics change after surgery (i.e., faster and more intense effects of alcohol after surgery) [42].

However, because the AUDIT also captures aspects of drinking behavior beyond quantity and frequency, changes in total AUDIT scores after surgery may not necessarily indicate actual increases or decreases in alcohol consumption. To verify that the identified sub-groups truly reflected changes in consumption, additional analyses were performed to determine whether the total score on the first three items of the AUDIT (i.e., those assessing drinking frequency and quantity) changed within each subgroup after surgery.

Finally, comparisons between the different groups of alcohol use evolution for preoperative (i.e., preoperative emotional eating, emotion regulation, and experiential avoidance scores) and postoperative variables (i.e., postoperative anxiety and depression scores) were carried out using Kruskal-Wallis tests.

Results

Participant characteristics

322 individuals completed the baseline questionnaires. 24 were excluded due to incomplete responses on key alcohol-related measures (e.g., the AUDIT or the drinking motives questionnaire), resulting in a final sample of 298 participants at baseline. Six months post-surgery, 252 individuals completed follow-up questionnaires (retention rate of 84.6%). Participants' sociodemographic and anthropometric characteristics are presented in Table 2. Most participants were women and had undergone RYGB.

Compared to those who completed the six-month questionnaires, participants lost to follow-up were younger, with a median age of 36 years versus 39.5 years ($U = 4287.5$, $p < .01$). No

other significant differences were detected between the two groups in terms of sociodemographic variables or questionnaire scores.

Alcohol consumption and drinking motives before versus six months after surgery in the overall sample (hypotheses 1 and 2)

Overall, the prevalence of individuals with probable AUD significantly decreased six months postoperatively (7.9% before vs. 3.2% after bariatric surgery, $p < .01$), while the proportion of abstinent individuals increased (27.4% before vs. 40.5% after bariatric surgery, $p < .001$). Among the eight participants with AUD after surgery, six (75%) already met the AUD threshold at baseline (i.e. score ≥ 8 on the AUDIT). Of the remaining two, one did not present with AUD at the time of the operation but had experienced such issues earlier in life (positive CAGE score), while the other showed no indicators of AUD prior to surgery (negative AUDIT and CAGE scores).

There was also a significant reduction in total AUDIT scores ($z = -6.28$; $p < .001$) and enhancement drinking motives ($z = -2.16$; $p = .03$) for the entire sample after the operation. However, coping drinking motives remained stable ($z = -.99$; $p = .32$). Although not the specific focus of this research, exploratory analyses were conducted to determine whether conformity and social drinking motives had changed since surgery. A significant decrease in social drinking motives was observed ($z = -2.53$; $p = .01$) while conformity motives were stable ($z = -1.75$; $p = .08$). Table 3 summarizes participants' AUDIT and DMQ-R SF scores before and after surgery.

Procedure-specific analyses indicated that both RYGB and SG were associated with decreases in AUDIT scores (RYGB: $z = -6.02$, $p < .001$; SG: $z = -2.25$, $p = .02$). There were no significant changes in drinking motives after RYGB, except for a decrease in social motives (enhancement [$z = -1.88$, $p = .06$], coping [$z = -1.17$, $p = .24$], social [$z = -2.56$, $p = .01$] and

conformity motives [z = - 1.12, p = .26]). After SG, only conformity motives decreased significantly (enhancement [z = -1.04, p = .30], coping [z = -0.43, p =.66], social [z = - 0.51, p = .61], and conformity motives [z = -2.89; p < .01]).

Identification of subgroups and characteristics (hypothesis 3)

The overall reduction in AUD prevalence and AUDIT scores across the entire sample masked differing individual trajectories, with some participants significantly increasing their alcohol consumption. To better capture these variations, participants were categorized into three groups on the basis of the differences in their pre- and postoperative total AUDIT scores. This analysis resulted in three groups: 1) a group with no change in their AUDIT scores from before to after surgery (zero score difference, n = 116, 46%), 2) a group that reduced its AUDIT scores post-surgery (negative score difference; n = 113, 44.8%), and 3) a group that increased its scores after the operation (positive score difference; n = 23, 9.1%). Statistical tests confirmed a significant decrease in AUDIT scores in group 2 (z = -9.34; p < .001) and a significant increase in group 3 following surgery (z = -4.23; p < .001). Descriptive statistics for these groups are presented in Table 4.

As mentioned in the Methods, to verify that the subgroups truly reflected stable, decreased, and increased alcohol use after surgery, additional analyses were conducted on the first three AUDIT items, which specifically assess frequency and quantity of drinking. The analyses showed no significant change in the total score on these three items in the stable group (z = –1.34; p = .18), a significant increase in the "increase" group (z = –3.47; p < .001), and a significant decrease in the "decrease" group (z = –9.16; p < .001) (see Table 4). These findings suggest that the overall AUDIT changes observed in the sub-groups do reflect actual shifts in alcohol consumption.

For exploratory purposes, changes in AUD prevalence and drinking motives were also examined within each group. In group 1, just as the AUDIT scores remained unchanged, there was also no change in the prevalence of AUD: only one participant (0.9%) met the threshold for AUD both before and after surgery. There was also no significant difference in the scores on the various types of drinking motives before and after surgery (enhancement [z = -0.03; p = .98], coping [z = -0.95; p = .34], social [z = -0.29; p = .78], and conformity drinking motives [z = -1.77; p = .08]).

In group two, alongside the decrease in AUDIT scores, the number of participants meeting the AUD threshold dropped from 17 (15%) before surgery to 3 (2.7%) afterward (p < .001). There was also a significant reduction in enhancement (z = -3.33; p < .001), coping (z = -3.07; p < .01) and social drinking motives (z = -4.23; p < .001), while conformity motives remained stable (z = -1.63; p = .10).

In group three, the rise in the AUDIT scores was accompanied by a non-significant increase in the prevalence of AUD. Two participants were experiencing AUD at the time of surgery (8.7%) and four (17.4%) reached the AUD level postoperatively (p = .14). Furthermore, this group showed a significant rise only in coping motives (z = -2.82; p < .01), with no significant changes observed in other types of drinking motives (enhancement [z = -1.22; p = .22]; conformity [z = -1.12; p < .26]; social motives [z = -1.71; p = .09]).

Of note, most participants in the last group were women (17 out of 23; 73.9%), had undergone RYGB (16 out of 23; 69.6%), and reported no lifetime history of alcohol problems (assessed by the CAGE) prior to surgery (17 out of 23; 73.9%).

Differences in pre- and postoperative psychological variables between groups (hypothesis 4)

The three groups did not differ according to their emotional eating (H(2) = .1.75, p = .42), experiential avoidance (H(2) = 5.12, p = .08), and emotion regulation scores (H(2) = .62, p =

.74) prior to surgery. Similarly, they did not differ in their postoperative depression scores ($H(2) = 2.74$, $p = .25$). However, a significant difference was observed in their postoperative anxiety levels ($H(2) = 7.12$, $p = 0.03$) (see Table 5). Specifically, the group with increased alcohol consumption reported higher anxiety after surgery—scoring 8 on the HADS-A—compared to the groups with stable or reduced alcohol use, which scored 6.

Exploratory analyses were conducted to examine if the three groups experienced significant changes in their anxiety and depression scores from before to after surgery. Depression and anxiety scores significantly decreased in both the stable group (anxiety: $z = -5.24$, $p < .001$; depression: $z = -6.44$, $p < .001$) and the group with reduced alcohol consumption (anxiety: $z = -6.74$, $p < .001$; depression: $z = -6.60$, $p < .001$) following surgery. The group that increased its consumption also experienced a reduction in depressive symptoms, but these participants' anxiety levels remained high and unchanged from before to after bariatric surgery (depression: $z = -2.04$, $p = .04$; anxiety: $z = -0.89$, $p = .37$) (see Table 6).

Discussion

This study aimed to explore the evolution of alcohol consumption and drinking motives in the first months after bariatric surgery, as well as the psychological factors associated with increased postoperative consumption. Several interesting findings emerged from this research.

First, contrary to hypothesis 1, the overall alcohol consumption and the proportion of individuals with probable AUD declined from before to after bariatric surgery. This indicates a positive trend among patients in the early postoperative period. However, a closer examination revealed significant variability among participants even at this early stage: 9.1% increased their alcohol use at six months, 46% maintained the same level of alcohol consumption and 44.8% reduced their intake. Notably, over 70% (17 out of 23) of those who increased their consumption reported no history of problematic use at baseline. This means

they were not relapsing and returning to older problematic drinking habits. While such variability had been reported in previous studies one or two years after surgery [43, 44], the present research indicates it is already observable at six months. Therefore, paying attention to alcohol evolution only one or two years postoperatively may lead to miss some changes occurring earlier in the postoperative follow-up.

Among participants who increased their alcohol use, most had not yet reached the threshold for potential AUD. Nonetheless, it is concerning that a sub-group of patients experienced a median increase of two points on the AUDIT within just six months. Any rise in alcohol consumption warrants attention, as even small amounts can lead to negative consequences [45]. This is even more concerning for patients with bariatric surgery, as alcohol metabolism changes postoperatively [42], resulting in more intense effects of alcohol and negative consequences (e.g., alcohol-related liver disease) occurring earlier [46, 47], and potentially with smaller quantities [48].

The second significant finding of this study relates to the reasons behind alcohol consumption after surgery. To our knowledge, this is the first quantitative study to explore this aspect. Overall, there was a decrease in enhancement, social and coping drinking motives in the total sample after surgery. However, participants who increased their alcohol intake reported different motivations for drinking compared to their pre-surgery habits. Specifically, coping motives increased among these individuals, while other motives (i.e., enhancement, social and conformity) remained unchanged. This is concerning, as coping-related motives are a strong predictor of problematic alcohol use [15-17]. Although it is not possible to compare this result with previous quantitative studies, they align with prior qualitative research, where many participants mentioned they began drinking after surgery to cope with psychological difficulties, ultimately leading to alcohol dependence [18-19].

Finally, an important finding in this study was that, contrary to hypothesis 4, no preoperative psychological variables were associated with increased alcohol use post-surgery. Only high levels of postoperative anxiety and maintenance of high anxiety levels from before to after surgery were associated with increased alcohol consumption postoperatively. While previous qualitative studies consistently suggested persisting psychological problems and postoperative psychological distress as a cause for increased alcohol use after surgery [18-19], the present study is one of the few to quantitatively support it. Additional support for these findings comes from King et al. [8], who demonstrated that less improvement or a worsening of mental health after surgery predicted postoperative AUD. Furthermore, Mitchell et al. [49] found that individuals with postoperative AUD exhibited a higher prevalence of certain anxiety disorders following the operation. Still, more research is needed to better understand the psychological predictors of increased alcohol use after surgery.

This study's findings should be interpreted in light of several limitations. First, the results relied on self-reported data, which may involve biases and inaccuracies regarding alcohol consumption levels. Additionally, although participants were assured their responses were anonymous and not shared with healthcare providers, the fact that surgeons introduced the study may have influenced the way some participants reported their alcohol use, due to concerns about judgment or perceived consequences. Second, the use of the AUDIT six months after surgery may be problematic. Although participants were instructed to report on their alcohol use during the past six months and not the last year, the original AUDIT items were left unchanged, and some of them still referred to consumption over the past 12 months. This mismatch may have led some participants to consider a longer timeframe despite the clear instructions, potentially introducing a measurement bias. However, this risk is likely minimal, as the DMQ-R SF and other alcohol-related questions (e.g., binge drinking behaviors and perceived effects of alcohol since surgery—data not reported in this

manuscript) in the postoperative assessment also explicitly referred to the last six months, reinforcing that the postoperative period was the intended timeframe. Third, the definition of the alcohol evolution subgroups was based on one specific, non-conventional classification method. This approach was chosen in the absence of guidelines on what would constitute a significant increase or decrease in AUDIT scores for operated patients and because it is easily reproducible, enabling other studies to confirm or challenge the present findings. Another categorization approach could lead to different results. Fourth, the enhancement subscale of the DMQ-R SF and the depression subscale of the HADS showed unsatisfactory internal consistency after surgery, which may limit the reliability of results for these constructs. Fifth, the recruitment was based on voluntary participation. No information was available about why some individuals declined to participate. It is possible that some of them declined due to concerns about problematic alcohol use. Sixth, the study was introduced to patients by their surgeons. No information was available about the annual number of bariatric procedures performed in the participating centers, and it is unclear whether all eligible individuals across the four hospitals were consistently invited to participate. This makes it difficult to estimate the overall enrollment rate and to determine whether the sample is representative of the patient population attending these hospitals. Nonetheless, the sample characteristics were close to those of the Belgian bariatric population, with a majority of women, a mean age around 40 years, and a mean BMI over 40. A higher percentage in the sample had undergone RYGB (79% compared to 63%), but the Belgian data are from 2019 and may have changed since then [(50)]. Lastly, the study did not include a control group. This makes it challenging to determine whether the observed changes are specifically related to the surgery itself or to other factors.

Despite these limitations, this study also presents some strengths. These include its longitudinal design, participant recruitment from four hospitals across different geographical

regions in Belgium, anonymous and independent data collection to minimize social desirability bias, and a high response rate several months after surgery (84.6%).

Clinical implications

This research has several implications for the pre- and postoperative care of patients undergoing bariatric surgery. First, it highlights the six-month postoperative mark as a potentially important time to identify individuals who have already increased their alcohol use. Early intervention at this stage can help prevent progression to AUD. Conversely, this period also offers an opportunity to identify patients who have reduced their alcohol intake and allow healthcare providers to support them in maintaining this positive change over the long term. Second, results indicate it is important to assess not only patients' alcohol consumption but also any changes in their drinking motives early after the operation, as drinking motives are strong predictors of problematic alcohol use and these are shown to change for some individuals as early as a few months after surgery. A rise in coping-related drinking motives should particularly draw bariatric teams' attention. Finally, special care should be given to individuals reporting anxiety after surgery, as well as to those who do not experience any improvement in their anxiety post-operation, as postoperative anxiety issues appear to be associated with an increase in short-term alcohol use following surgery.

Conclusions

Six months after surgery, significant changes in alcohol consumption were observed. Nearly half of the participants reduced their alcohol intake, while a significant minority increased their consumption. Interestingly, those who drank more after surgery did so for different reasons than before; they turned to alcohol more frequently to cope with negative affects. Preoperative psychological factors did not predict a rise in alcohol consumption following bariatric surgery. Rather, only postoperative anxiety, along with the persistence of high

anxiety levels from before to after surgery, were associated with increased alcohol use afterward. Overall, these findings suggest that the six months following surgery may be a critical period for preventing the development of AUD and supporting sustained reduction in alcohol consumption among patients.

Funding: This study was partially funded by the [name of the university blinded].

Conflicts of interest: The authors declare that there is no conflict of interest.

Ethics approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This study was approved by the ethics committee of each hospital.

Consent to participate: Informed consent was obtained from all individual participants included in the study.

References

1. Magallares A, Schomerus G. Mental and physical health-related quality of life in obese patients before and after bariatric surgery: a meta-analysis. Psychol Health Med. 2015;20(2):165-76.
2. Courcoulas AP, Daigle CR, Arterburn DE. Long term outcomes of metabolic/bariatric surgery in adults. BMJ. 2023 Dec 18;383:e071027.
3. Bramming M, Becker U, Jørgensen MB, Neermark S, Bisgaard T, Tolstrup JS. Bariatric surgery and risk of alcohol use disorder: a register-based cohort study. Int J Epidemiol. 2021 Jan 23;49(6):1826-1835.
4. Conason A, Teixeira J, Hsu CH, Puma L, Knafo D, Geliebter A. Substance use following bariatric weight loss surgery. JAMA Surg. 2013 Feb;148(2):145-50.
5. Maciejewski ML, Smith VA, Berkowitz TSZ, Arterburn DE, Mitchell JE, Olsen MK, Liu CF, Livingston EH, Funk LM, Adeyemo A, Bradley KA. Association of Bariatric Surgical Procedures With Changes in Unhealthy Alcohol Use Among US Veterans. JAMA Netw Open. 2020 Dec 1;3(12):e2028117.
6. Svensson PA, Anveden Å, Romeo S, Peltonen M, Ahlin S, Burza MA, Carlsson B, Jacobson P, Lindroos AK, Lönroth H, Maglio C, Näslund I, Sjöholm K, Wedel H, Söderpalm B, Sjöström L, Carlsson LM. Alcohol consumption and alcohol problems after bariatric surgery in the Swedish obese subjects study. Obesity. 2013 Dec;21(12):2444-51.
7. Wong E, Fleishman A, Brem A, Jones DB, Wee CC. High-Risk Alcohol Use and Disordered Eating Behavior Before and 1 Year After Sleeve Gastrectomy. Obes Surg. 2022 Mar;32(3):593-598.
8. King WC, Chen JY, Courcoulas AP, Dakin GF, Engel SG, Flum DR, Hinojosa MW, Kalarchian MA, Mattar SG, Mitchell JE, Pomp A, Pories WJ, Steffen KJ, White GE, Wolfe BM, Yanovski SZ. Alcohol and other substance use after bariatric surgery:

prospective evidence from a U.S. multicenter cohort study. Surg Obes Relat Dis. 2017 Aug;13(8):1392-1402.

9. King WC, Chen JY, Mitchell JE, Kalarchian MA, Steffen KJ, Engel SG, Courcoulas AP, Pories WJ, Yanovski SZ. Prevalence of alcohol use disorders before and after bariatric surgery. JAMA. 2012 Jun 20;307(23):2516-25.
10. Ibrahim N, Alameddine M, Brennan J, Sessine M, Holliday C, Ghaferi AA. New onset alcohol use disorder following bariatric surgery. Surg Endosc. 2019 Aug;33(8):2521-2530.
11. Kanerva N, Larsson I, Peltonen M, Lindroos AK, Carlsson LM. Sociodemographic and lifestyle factors as determinants of energy intake and macronutrient composition: a 10-year follow-up after bariatric surgery. Surg Obes Relat Dis. 2017 Sep;13(9):1572-1583.
12. Murray SM, Tweardy S, Geliebter A, Avena NM. A Longitudinal Preliminary Study of Addiction-Like Responses to Food and Alcohol Consumption Among Individuals Undergoing Weight Loss Surgery. Obes Surg. 2019 Aug;29(8):2700-2703.
13. Tae B, Pelaggi ER, Moreira JG, Waisberg J, de Matos LL, D'Elia G. Impact of bariatric surgery on depression and anxiety symptons, bulimic behaviors and quality of life. Rev Col Bras Cir. 2014 May-Jun;41(3):155-60.
14. Kuntsche E, Kuntsche S. Development and validation of the Drinking Motive Questionnaire Revised Short Form (DMQ-R SF). J Clin Child Adolesc Psychol. 2009 Nov;38(6):899-908.
15. Bresin K, Mekawi Y. The "Why" of Drinking Matters: A Meta-Analysis of the Association Between Drinking Motives and Drinking Outcomes. Alcohol Clin Exp Res. 2021 Jan;45(1):38-50.
16. Kuntsche E, Knibbe R, Gmel G, Engels R. Why do young people drink? A review of drinking motives. Clin Psychol Rev. 2005 Nov;25(7):841-61.

17. Merrill JE, Wardell JD, Read JP. Drinking motives in the prospective prediction of unique alcohol-related consequences in college students. J Stud Alcohol Drugs. 2014 Jan;75(1):93-102.

18. Er E, Durieux N, Vander Haegen M, Flahault C, Etienne AM. Patients' perceptions of the mechanisms underlying alcohol use problems after bariatric surgery: A qualitative systematic review. Clin Obes. 2023 Feb;13(1):e12551.

19. Er E, Flahault C, Etienne AM. 'We're outside the norm again because of the thing that allowed us to be inside the norm': An interpretative phenomenological analysis of the experience of developing an alcohol use disorder after bariatric surgery. Clin Obes. 2024 Apr;14(2):e12630. doi: 10.1111/cob.12630. Epub 2023 Nov 30. PMID: 38036451.

20. Chiappetta S, Stier C, Hadid MA, Malo N, Theodoridou S, Weiner R, Weiner S. Remission of Food Addiction Does Not Induce Cross-Addiction after Sleeve Gastrectomy and Gastric Bypass: A Prospective Cohort Study. Obes Facts. 2020;13(3):307-320.

21. Dickhut C, Hase C, Gruner-Labitzke K, Mall JW, Köhler H, de Zwaan M, Müller A. No addiction transfer from preoperative food addiction to other addictive behaviors during the first year after bariatric surgery. Eur Eat Disord Rev. 2021 Nov;29(6):924-936.

22. Freire CC, Zanella MT, Arasaki CH, Segal A, Carneiro G. Binge eating disorder is not predictive of alcohol abuse disorders in long-term follow-up period after Roux-en-Y gastric bypass surgery. Eat Weight Disord. 2020 Jun;25(3):637-642.

23. Guisado Macias JA, Vaz Leal FJ. Psychopathological differences between morbidly obese binge eaters and non-binge eaters after bariatric surgery. Eat Weight Disord. 2003 Dec;8(4):315-8.

24. Siikaluoma L, Stenberg E, Raoof M. Prevalence of and Risk Factors Associated with Alcohol Overconsumption at 2 Years After Bariatric Surgery. Obes Surg. 2022 Jul;32(7):1-6.

25. Miller-Matero LR, Hamann A, LaLonde L, Martens KM, Son J, Clark-Sienkiewicz S, Sata M, Coleman JP, Hecht LM, Braciszewski JM, Carlin AM. Predictors of Alcohol Use after Bariatric Surgery. J Clin Psychol Med Settings. 2021 Sep;28(3):596-602.

26. Aslan IH, Dorey L, Grant JE, Chamberlain SR. Emotion regulation across psychiatric disorders. CNS Spectr. 2024 Jun;29(3):215-220.

27. Hayes SC, Wilson KG, Gifford EV, Follette VM, Strosahl K. Experimental avoidance and behavioral disorders: a functional dimensional approach to diagnosis and treatment. J Consult Clin Psychol. 1996 Dec;64(6):1152-68.

28. Béland S, Cousineau D, Loye N. Using The McDonald's Omega Coefficient Instead of Cronbach's Alpha. McGill Journal Of Education. 2018 Aug 8; 52(3), 791-804.

29. Gache P, Michaud P, Landry U, Accietto C, Arfaoui S, Wenger O, Daeppen JB. The Alcohol Use Disorders Identification Test (AUDIT) as a screening tool for excessive drinking in primary care: reliability and validity of a French version. Alcohol Clin Exp Res. 2005 Nov;29(11):2001-7.

30. Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. Addiction. 1993 Jun;88(6):791-804.

31. Mayfield D, McLeod G, Hall P. The CAGE questionnaire: validation of a new alcoholism screening instrument. Am J Psychiatry. 1974 Oct;131(10):1121-3.

32. Rueff B, Crnac J, Darne B. Dépistage de malades "alcooliques" par l'autoquestionnaire systématique DETA. Parmi des consultants hospitaliers [Detection of alcoholic patients using the systematic CAGE autoquestionnaire. In out patients]. Presse Med. 1989 Oct 14;18(33):1654-6.

33. Rault A, Decamps G. (2021). Validation of French scales measuring the motivations to drink within the general student population and sports. Canadian Journal of Behavioural Science. 2022 Oct; 54(3), 241-248.

34. Bocéréan C, Dupret E. A validation study of the Hospital Anxiety and Depression Scale (HADS) in a large sample of French employees. BMC Psychiatry. 2014 Dec 16;14:354.

35. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. Acta Psychiatr Scand. 1983;67(6):361-370.

36. Lluch A, Kahn J, Stricker-Krongrad A, Ziegler O, Drouin P, Méjean L. Internal validation of a French version of the Dutch eating behaviour questionnaire. Eur Psychiatry. 1996;11(4):198-203.

37. Van Strien T, Frijters JE, Bergers GP, Defares PB. The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behavior. Int J Eat Disord. 1986;5(2):295-315.

38. Côté G, Gosselin P, Dagenais, I. Évaluation multidimensionnelle de la régulation des émotions : propriétés psychométriques d'une version francophone du Difficulties in Emotion Regulation Scale. Journal de Thérapie Comportementale et Cognitive. 2013;23(2), 63-72.

39. Gratz KL, Roemer L. Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. J Psychopathol Behav Assess. 2004;26(1):41-54.

40. Gámez W, Chmielewski M, Kotov R, Ruggero C, Suzuki N, Watson D. The brief experiential avoidance questionnaire: development and initial validation. Psychol Assess. 2014 Mar;26(1):35-45.

41. Er E, Wagener A, Étienne AM, Vander Haegen M. The Brief Experiential Avoidance Questionnaire: Validation of the French Version in Non-clinical Adults. Psychol Belg. 2024 Oct 4;64(1):152-165.

42. Acevedo MB, Teran-Garcia M, Bucholz KK, Eagon JC, Bartholow BD, Burd NA, Khan N, Rowitz B, Pepino MY. Alcohol sensitivity in women after undergoing bariatric surgery: a cross-sectional study. Surg Obes Relat Dis. 2020 Apr;16(4):536-544.

43. Lent MR, Hayes SM, Wood GC, Napolitano MA, Argyropoulos G, Gerhard GS, Foster GD, Still CD. Smoking and alcohol use in gastric bypass patients. Eat Behav. 2013 Dec;14(4):460-3.

44. Wee CC, Mukamal KJ, Huskey KW, Davis RB, Colten ME, Bolcic-Jankovic D, Apovian CM, Jones DB, Blackburn GL. High-risk alcohol use after weight loss surgery. Surg Obes Relat Dis. 2014 May-Jun;10(3):508-13.

45. World Health Organization. (2024). Global status report on alcohol and health and treatment of substance use disorders. *Geneva: World Health Organization*.

46. Lefere S, Stroobant L, Verhelst X, Vanlander A, Berrevoet F, Troisi RI, Van Nieuwenhove Y, Rogiers X, Van Vlierberghe H, Geerts A. Bariatric Surgery Patients Are at Risk for Alcoholic Liver Disease with Need for Liver Transplantation. Obes Surg. 2020 Nov;30(11):4659-4664.

47. Van Melkebeke L, Broekhoven AGC, Ostyn T, Korf H, Coenraad MJ, Vangoitsenhoven R, Van der Schueren B, Lannoo M, Van Malenstein H, Roskams T, van der Merwe S, Nevens F, Verbeek J. Patients with a History of Bariatric Surgery Are 8 Years Younger at Presentation with Severe Alcoholic Hepatitis. Obes Surg. 2023 Jan;33(1):284-292.

48. Onghena L, Van Nieuwenhove Y, Demeulenaere L, Devisscher L, Verhelst X, Degroote H, Raevens S, Van Vlierberghe H, Lefere S, Geerts A. Patients hospitalized with alcohol-

related liver disease and prior bariatric surgery are more prone to develop acute-on-chronic liver failure. Liver Int. 2023 Dec;43(12):2743-2751.

49. Mitchell JE, Steffen K, Engel S, King WC, Chen JY, Winters K, Sogg S, Sondag C, Kalarchian M, Elder K. Addictive disorders after Roux-en-Y gastric bypass. Surg Obes Relat Dis. 2015 Jul-Aug;11(4):897-905.

50. Louwagie P, Neyt M, Dossche D, Camberlin C, Geuzendam BT, Van Den Heede K, Van Brabant H. Efficacité, sécurité et coût-efficacité de la chirurgie de l'obésité. 2019. Available from: https://doi.org/10.57598/r316bs