TOG
OBESITY
PROTOCOLS &
PRACTICE POINTS

THE ASSOCIATION OF MAHARASHTRA OBSTETRIC & GYNAECOLOGICAL SOCIETIES
AMOGS

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MANAGEMENT OF OBESITY IN WOMEN:

Practice Points for Evidence-Based Care

Science Integra®

Preface

Dear Colleagues,

The TOG Functional Protocols and Practices initiative represents a significant step towards standardizing evidence-based, patient-centric care in women's health. Developed through the collective expertise of gynecologists, obstetricians, endocrinologists, and physicians, these protocols reflect the strength of multidisciplinary collaboration. By integrating diverse clinical perspectives, we have created practical recommendations that can enhance consistency in practice and improve patient outcomes. I congratulate all contributors whose dedication and commitment have made this valuable academic endeavor possible.

Warm Regards

Dr. Ameya Purandare
President, AMOGS

Dear Colleagues,

The TOG (Times of Gynaecology) Functional Protocols and Practices initiative is a testament to the power of collaborative medicine. Bringing together experts from gynecology, obstetrics, endocrinology, and internal medicine, this multidisciplinary effort has resulted in practical, evidence-based recommendations that address real-world clinical challenges. These protocols are designed to support clinicians in delivering standardized, holistic, and patient-centered care. I congratulate all the contributors and our academic partner Science Integra for their dedication in creating a valuable resource that will help enhance clinical practice and improve health outcomes for women.

Warm Regards

Dr. Rohan Palshetkar
Honorary Secretary, AMOGS

MANAGEMENT OF OBESITY IN WOMEN:
PRACTICE POINTS FOR EVIDENCE-BASED CARE

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GLOBAL AND INDIAN BURDEN OF OBESITY

Obesity has continued to rise at an alarming rate between 2020 and 2026, highlighting its position as one of the most significant public health challenges of the 21st century.[1] According to the World Health Organization, in 2022, nearly 2.5 billion adults aged ≥18 years were overweight, including over 890 million living with obesity. Globally, 43% of the adults were classified as being overweight, amongst whom 44% were women. The burden is equally concerning among younger populations. In 2022, more than 390 million children and adolescents aged 5–19 years were overweight, with prevalence increasing from 8% in 1990 to 20% in 2022. [2]

The rising burden of obesity is largely driven by lifestyle changes worldwide.[3] Since 1975, global obesity rates have tripled and are expected to rise further. By 2035, nearly 1.9 billion adults may be living with obesity. By 2050, around 3.8 billion adults, more than half of the global adult population, could be affected by overweight or obesity.[4]

In India, data from the Indian Council of Medical Research (ICMR) reported 254 million adults with generalized obesity and 351 million with abdominal obesity.[5] Projections suggest that obesity prevalence in India can triple by 2040, particularly among women.[6] In addition to health consequences, obesity imposes a substantial economic burden, reducing India's gross domestic product (GDP) by 1.2% in 2020, with projections reaching 1.8% by 2035.[7]

EPIDEMIOLOGY AND IMPACT OF OBESITY ACROSS WOMEN'S LIFE COURSE

In India, obesity impacts women across every stage of life. Among women of reproductive age, 22.6% are overweight and 10.7% are obese.[8] In children and adolescent girls, the prevalence stands at 15.4% for overweight and 9.16% for obesity, indicating an early onset of risk.[9,10] The burden is even higher among women with polycystic ovary syndrome (PCOS), where nearly 46% are overweight or obese.[11] Among pregnant and postpartum women (≥20 years), obesity prevalence is 12% and 13%, respectively.[12] In menopausal women (40–60 years), about 35.5% are affected, including 26% overweight and 9.5% obese.[8]

For women of reproductive age, obesity presents unique challenges that can negatively affect fertility, pregnancy outcomes, and the long-term health of both the mother and the child.[13]

Adolescents

Adolescence is a critical phase of physical and psychological development, and obesity during this period has long-term health effects. Excess weight in late adolescence or early adulthood increases the risk of Type 2 Diabetes later in life. Lifestyle habits formed during adolescence, diet and physical activity, strongly influence the risk of non-communicable diseases, as well as frailty and impaired mobility. Adolescents with obesity are also more prone to physical inactivity and poor nutrition, worsening long-term health outcomes.[14]

Reproductive age: Impact on PCOS, pregnancy and infertility

Obesity disrupts metabolic balance through hormonal changes, chronic inflammation, and altered energy metabolism, impairing ovulation, oocyte quality, and

endometrial receptivity, thereby reducing fertility. Additionally, associated metabolic syndrome (MetS) further worsens reproductive outcomes by increasing time to pregnancy (TTP) and the risk of infertility.[13]

During pregnancy, obesity also poses significant risks for both the mother and the neonate. Maternal complications such as gestational diabetes mellitus (GDM), preeclampsia, and higher rates of cesarean delivery are more common among individuals with obesity. Furthermore, obesity has been associated with lower live birth rates and an increased risk of miscarriage.[13]

Obesity plays a central role in the pathogenesis and progression of PCOS by exacerbating insulin resistance and hyperinsulinaemia through impairment of the phosphoinositide 3-kinase (PI3K)-dependent insulin signalling pathway. This contributes to metabolic dysfunction and hyperandrogenism.[15]

Menopause

During menopause, declining estrogen levels lead to increased abdominal fat accumulation instead of fat distribution in the hips and thighs. This deficiency also increases insulin resistance, further promoting visceral fat storage.[16]

Postmenopause

Obesity is a significant health concern at all ages, but it poses particular risks in postmenopausal women due to its strong association with multiple chronic conditions. Postmenopausal women with overweight or obesity have an increased risk of cardiovascular disease, metabolic syndrome, type 2 diabetes, certain cancers, joint disorders including osteoarthritis, sleep apnea, and higher overall mortality.[16]

These risks underscore the need for effective weight management strategies to improve maternal and offspring outcomes. Comprehensive care should include structured lifestyle interventions, such as dietary modifications, regular physical activity, and behavioral counselling along with appropriate pharmacotherapy.[13]

Objective

The clinical practice points aim to provide practical, evidence-based guidance for the assessment and management of obesity and overweight across a woman's life course, to support informed clinical decision-making and optimize health outcomes.

Methodology

The practice points were developed based on a comprehensive review of current evidence and clinical guidelines related to the diagnosis and management of obesity. A multidisciplinary task force comprising of obstetricians and gynecologists, in-vitro fertilization (IVF) specialist was convened to review the available evidence, deliberate on key issues, and curate the document through expert consensus.

The task force evaluated the role of medical therapy, with particular emphasis on the importance of glucagon-like peptide-1 (GLP-1) receptor agonists in the management of obesity in women. Practice points were formulated through iterative discussions until consensus was achieved.

The initial draft of the document was prepared, and endorsed by the expert panel. A well-defined grading system (Table 1) was employed for the critical appraisal of evidence and for grading the strength of recommendations.

Table 1. Level of evidence and grading strength of recommendations	
Level of evidence	**Description**
Level A	Data derived from multiple randomized trials or meta-analyses, or evidence-based clinical practice guidelines
Level B	Data derived from a single randomized trial or a large non-randomized trial
Level C	Consensus of experts or small studies, retrospective studies or registries, or narrative/literature reviews
Level D	Data derived from Clinical experience
Class of recommendations	
Class I	Evidence and or general agreement that a given treatment or procedure is beneficial, useful or effective. It is recommended.
Class IIa	Evidence is in favor of efficacy/usefulness and should be considered
Class IIb	Efficacy/usefulness is less well established, and recommendations may be considered
Class III	Evidence and or general agreement that a given treatment or procedure is not beneficial, useful or effective, and in some cases may cause harm. Not recommended

SCREENING OR RISK STRATIFICATION OF OBESITY

PRACTICE POINTS

Patients should undergo detailed physical, clinical, and biochemical assessment to diagnose obesity and identify associated comorbidities early. (Level A, Class I)

In Asian populations, BMI cut-offs of >23 kg/m² for overweight and ≥25 kg/m² for obesity can be used to enhance risk stratification. (Level A, Class I)

Waist circumference and a waist-to-hip ratio can be used as simple and reliable indicators of central obesity and cardiometabolic risk. (Level A, Class IIa)

Metabolic Score for Visceral Fat (METS-VF) can be used to assess visceral adiposity, with a cut-off ≥7.3 indicating increased visceral fat in the Indian population. (Level B, Class IIa)

Discussion

Patients should undergo a comprehensive physical, clinical, and biochemical evaluation to diagnose obesity, identify associated comorbidities, and guide appropriate management.[8]

Body mass index (BMI) is a widely accepted screening tool used to identify overweight and obesity. For Asian populations, a BMI >23 kg/m² is classified as overweight, whereas a BMI >25 kg/m² is classified as obesity. An elevated BMI is a significant risk factor for several non-communicable diseases, including cardiovascular disease (CVD), diabetes, musculoskeletal disorders, and certain malignancies.[17]

However, BMI does not directly assess body composition or account for fat distribution. As a result, individuals with greater muscle mass and lower body fat may still fall within the overweight or obesity BMI categories.[18] Therefore, additional anthropometric measures such as waist circumference and waist-to-hip ratio should be considered for better risk prediction, particularly, in the Indian population.[8]

Waist circumference and waist-to-hip ratio (WHR) are key indicators of central adiposity. In Asian populations, lower cut-offs are recommended, with

waist circumference thresholds of >90 cm in men and >80 cm in women. A WHR value ≥0.85 in women is associated with an increased risk of cardiometabolic disorders.[17]

According to the Endocrine Society of India (ESI), baseline investigations in individuals with obesity should include assessment of:[8]

- Glycemic status (fasting blood glucose, postprandial blood glucose, and HbA1c)
- Organ function tests (renal and liver function tests)
- Lipid profile (low density lipoprotein [LDL] and high density lipoprotein [HDL]), thyroid function (throid stimulating hormone [TSH])
- Serum electrolytes, and uric acid levels.
- Targeted assessments: Chest X-ray, electrocardiogram (ECG), body composition analysis using DXA scan, ultrasound abdomen or upper gastrointestinal endoscopy, and sleep apnea

Furthermore, the Metabolic Score for Visceral Fat (METS-VF) can be utilized to estimate visceral adiposity, with a cut-off value of 7.3 demonstrating good sensitivity and reasonable specificity for predicting increased visceral adipose tissue in the Indian population.[8]

The Obesity Medicine Association (OMA) recommends a structured, multifactorial approach that includes detailed clinical history, physical examination, and targeted investigations. Clinical assessment should encompass vital parameters such as blood pressure and pulse rate, along with comprehensive anthropometric measurements, including BMI, WHR, and neck circumference. Laboratory evaluation can be expanded to include markers of insulin resistance such as homeostatic model assessment of insulin resistance (HOMA-IR), fasting insulin, C-peptide, and proinsulin levels. In patients with elevated triglycerides, additional markers such as apo lipoprotein B or lipoprotein(a) may also be considered.[19]

Early identification and timely management are essential to reduce the risk factors associated with the disease.[8]

MANAGEMENT OF OBESITY

PRACTICE POINTS

Lifestyle modification, including diet, physical activity, and behavioural interventions, supports sustainable weight loss, improves cardiometabolic outcomes, and promotes long-term adherence. (Level A, Class I)

Pharmacotherapy can be considered as part of comprehensive obesity management, as lifestyle and behavioural interventions alone are often insufficient for sustained weight loss. (Level A, Class IIa)

Discussion

Lifestyle and behavioural interventions for obesity

Obesity requires lifelong, multimodal management, incorporating lifestyle interventions, behavioural therapy, and pharmacotherapy and/or bariatric surgery when indicated.[18] Lifestyle modification remains the first-line approach in the management of obesity.[20]

Major clinical guidelines, including American Association of Clinical Endocrinology (AACE), European Association for the Study of Obesity (EASO), the Canadian Adult Obesity Clinical Practice Guidelines and the Diabetes Nutrition Study Group /

European Association for the Study of Diabetes (DNSG/EASD) emphasize the importance of a personalized nutrition strategy in the management of obesity. These recommendations highlight the role of shared decision-making and culturally appropriate dietary advice to support overall health and promote long-term adherence to healthy eating patterns.[21,22,23,24]

Adequate dietary fibre intake is recommended to improve gut health and cardiometabolic outcomes, with suggested intakes of ≥25 g/day for women and ≥30 g/day for men, and ≥35 g/day for individuals with diabetes. Furthermore, during phases of active weight loss, a higher protein intake of 1.2–1.5 g/kg of actual body weight per day (or approximately 25–30% of total energy intake in a 1600 kcal/day diet) is recommended to help preserve lean muscle mass, particularly when combined with regular physical activity.[21]

An individualized physical activity program is a key component of obesity management and includes at least 150 minutes per week of moderate-to-vigorous intensity aerobic activity, along with resistance training, to support weight reduction and facilitate long-term weight maintenance.[21]

In addition, behavioural interventions play an important role in achieving sustainable weight management. These strategies include self-monitoring of body weight, dietary intake, and physical activity; nutritional counselling; regular engagement in physical activity; identification of barriers to weight loss; peer or social support; and relapse-prevention strategies to help maintain long-term lifestyle changes.[18]

Unmet need of lifestyle and behavioural interventions

Although lifestyle and behavioural interventions form the foundation of obesity management, their long-term effectiveness is often limited. Dietary modification, physical activity, and behavioural strategies can support weight reduction; however, these approaches insufficient to achieve the 5–10% weight loss required for meaningful improvements in comorbidities and quality of life.[25]

Medical nutrition therapy is an important component of obesity management; however, when used alone, it may be insufficient to sustain long-term weight loss. Caloric restriction can trigger compensatory physiological adaptations, including reduced energy expenditure, decreased levels of satiety hormones such as leptin and cholecystokinin, and increased ghrelin levels and appetite. These changes promote greater caloric intake and contribute to weight regain, making long-term weight maintenance challenging despite continued lifestyle efforts.[26,27]

Similarly, the impact of physical activity on weight loss varies widely among individuals due to biological, metabolic, and psychosocial factors, and is not solely determined by individual effort.[26]

Therefore, when lifestyle and behavioural interventions alone do not achieve adequate weight loss or health improvement, additional therapeutic options such as pharmacotherapy can be considered as part of comprehensive obesity management.[25,26]

PHARMACOTHERAPY FOR OBESITY MANAGEMENT

PRACTICE POINTS

Obesity management may combine lifestyle interventions, psychological support when needed. (Level A, Class I)

Pharmacotherapy can be considered for adults with BMI >27 kg/m² or >25 kg/m² with comorbidities when lifestyle interventions are inadequate. (Level A, Class I)

Pharmacotherapy can be tailored to individual clinical needs, preferences, and long-term health goals using shared decision-making due to the modest and often unsustained weight loss (3–5%) with lifestyle measures alone. (Level A, Class I)

Discussion

Sustained weight loss in individuals with obesity is associated with significant health improvements. Lifestyle and behavioral interventions alone result in modest weight loss of about 3–5%, which is often difficult to maintain long term and may be insufficient to improve many adiposity-related complications. In addition to psychological support, medical nutrition therapy, and increased physical activity, pharmacotherapy represents an important component of obesity management. The treatment should be individualized to help achieve weight reduction and optimize overall health outcomes. Further, in the absence of evidence guiding decisions, a shared decision-making approach that incorporates clinical priorities and patient preferences is recommended.[28]

As per the Endocrine Society of India (ESI) 2025 update, addition of pharmacotherapy may benefit adults with obesity, particularly those with BMI>27 kg/m² or BMI >25 kg/m² with obesity related comorbidities such as diabetes mellitus, hypertension, dyslipidemia, when lifestyle measures alone do not achieve adequate weight reduction.[29] Indian consensus guidelines further highlight that Indians develop metabolic and cardiovascular complications at lower BMI and waist circumference thresholds, with abdominal obesity and insulin resistance being highly prevalent, thereby warranting earlier identification and intervention.[30]

A 2025 update of the Canadian guideline recommends that obesity pharmacotherapy, alongside lifestyle and behavioral interventions should be individualized according to patient values, preferences, and treatment goals to ensure safe, effective, culturally acceptable, and affordable long-term care. Weekly Semaglutide 2.4 mg is recommended for adults with BMI ≥27 kg/m² and adiposity-related complications as part of comprehensive obesity management.[28]

ROLE OF ANTI-OBESITY MEDICATIONS

PRACTICE POINTS

GLP-1 receptor agonists can be considered as significant options for obesity management due to their robust efficacy, safety, and substantial weight loss (~12–20%) along with improvement in obesity-related complications. (Level B, Class I)

Initiate GLP-1/GIP receptor agonists at the lowest available dose and titrate gradually (every ~4 weeks) to minimize gastrointestinal adverse effects, for progressive weight loss with maximal benefits over months. (Level B, Class I)

Newer long-acting agents such as Semaglutide, tirzepatide with once-weekly dosing can be preferred, as the prolonged receptor activity enhances adherence, supports sustained weight loss, and contributes to long-term disease modification. (Level B, Class I)

Discussion

Anti-obesity medications (AOMs) support weight loss and reduce obesity-related complications and have demonstrated efficacy in clinical trials.[28] The Food and Drug Administration (FDA)-approved agents include the intestinal lipase inhibitor orlistat, phentermine, phentermine–topiramate, bupropion–naltrexone, and the glucagon-like peptide receptor agonists (GLP-1 RAs) liraglutide and Semaglutide, as well as the dual GLP-1/glucose-dependent insulinotropic polypeptide (GIP) agonist tirzepatide. Earlier medications (orlistat, bupropion-naltrexone, phentermine-topiramate, and liraglutide) were generally observed to produce modest placebo-corrected weight loss (about 3–10%) and may have variable adverse-effect profiles without clear cardiometabolic disease-modifying benefits. Although they remain options for some patients, newer GLP-1 based therapies with greater efficacy, improved tolerability, and metabolic benefits are increasingly preferred in the current obesity pharmacotherapy.[31]

GLP-1 receptor agonists: An effective, safe, and well-tolerated treatment for obesity

GLP-1 RAs are effective, safe, and well-tolerated treatments for obesity, demonstrating significant weight loss and broader disease-modifying benefits thereby decreasing the rapid rise in obesity and related complications. Newer agents such as Semaglutide and tirzepatide are reported to achieve ~12–20% total weight loss. Structural modifications enhance potency and prolong action, enabling once-weekly dosing. The newer GLP-1 RAs are available in 5 to 6 titratable doses, starting at the lowest dose and escalating incrementally every 4 weeks to improve tolerability, with weight loss observed over months and maximal effects achieved in a year. Their sustained efficacy and benefits on obesity-related complications position GLP-1 RAs as leading first-line options in obesity management.[31]

Semaglutide was approved for type 2 diabetes (FDA 2017; European Medicines Agency [EMA] 2018) and later for weight management in individuals with obesity or overweight with comorbidities (FDA 2021; EMA 2022). It induces weight loss via central appetite regulation, enhancing satiety and suppressing hunger through hypothalamic pathways. The peripheral actions include delayed gastric emptying, leading to reduced calorie intake and improved postprandial glycemia contributing to improved metabolic control. This GLP-1 analogue has 94% amino acid sequence homology and mimics the physiological effects of endogenous GLP-1, providing benefits in both glycemic control and body weight regulation.

Subcutaneous Semaglutide is administered once weekly via subcutaneous injection at doses of 0.25 mg, 0.5 mg, 1.0 mg, 1.7 mg, and 2.4 mg. Alternatively, it may be administered daily orally in doses of 3 mg, 7 mg, or 14 mg.[32]

Maintenance of weight loss is a central goal in obesity management. In adults with overweight or obesity, continuation of subcutaneous Semaglutide at the maintenance dose of 2.4 mg once weekly, compared with switching to placebo, results in continued weight loss over 48 weeks.[33]

Semaglutide is approved at doses up to 1.0 mg once weekly for the treatment of type 2 diabetes and at 2.4 mg once weekly for weight management in individuals without diabetes.[33,34] Higher doses (e.g., 7.2 mg) have also been shown to achieve greater reductions in body weight.[34]

Comparative analysis of GLP-1 RAs for management of obesity

GLP-1 receptor agonists differ in clinical effects based on receptor binding and duration of action. Short-acting agents like exenatide and lixisenatide have transient receptor activity, require frequent dosing, and show modest effects on fasting glucose and weight. In contrast, long-acting agents such as liraglutide, Semaglutide, dulaglutide, and tirzepatide provide sustained receptor activation, leading to better glycemic control and greater weight loss. Among these, once-weekly Semaglutide (2.4 mg) achieves greater average weight loss than liraglutide.[32] The FDA advises careful monitoring of patients on tirzepatide, particularly those with kidney disease, diabetic retinopathy, or a history of depression or suicidal ideation. Semaglutide, in contrast, is a more established therapy with robust long-term evidence supporting its use in obesity management.[36,37]

Semaglutide offers flexibility with both subcutaneous and oral formulations, multiple dosing options, a favourable cardiovascular profile, and evidence of benefit in conditions such as hepatic steatosis, sleep apnea, heart failure with preserved ejection fraction (HFpEF), and prevention of type 2 diabetes in prediabetes.[32]

Checklist for investigation of patients before starting Semaglutide[8,35]

Indication	☐ Type 2 diabetes mellitus ☐ Obesity ☐ Overweight with comorbidities Height: _____ cm Weight: _____ kg BMI: _____ kg/m² Waist circumference: _____ cm
Medical history	☐ Type 2 diabetes (Duration: ____ yrs) ☐ Hypertension ☐ Dyslipidemia ☐ PCOS ☐ NAFLD / fatty liver ☐ CAD / CV disease ☐ Previous weight-loss treatment
Contraindications	☐ Pregnancy / lactation ☐ H/O pancreatitis ☐ H/O medullary thyroid carcinoma ☐ MEN type 2 ☐ Severe GI disease (Gastroparesis) ☐ Severe renal disease ☐ Diabetic retinopathy
Family history	☐ Thyroid cancer ☐ Diabetes ☐ Obesity ☐ Cardiovascular disease
Baseline investigations	Glycemic profile: ☐ FBS _____ mg/dL ☐ PPBS _____ mg/dL ☐ HbA1c _____ % Renal Function: ☐ Urea _____ mg/dL ☐ Creatinine _____ mg/dL ☐ eGFR _____ mL/min Liver function: ☐ SGOT ☐ SGPT ☐ ALP ☐ Bilirubin _____ Lipid Profile: ☐ TC _____ ☐ LDL _____ ☐ HDL _____ ☐ TG _____ Thyroid Profile: ☐ TSH _____ ☐ Free T4 _____ Others (if indicated): ☐ Amylase ☐ Lipase ☐ Urine Microalbumin ☐ ECG
Patient counselling	☐ Drug benefits explained ☐ Dose escalation explained ☐ Injection technique taught ☐ Side effects explained ☐ Diet & lifestyle advice given ☐ Warning symptoms explained

BMI – Body Mass Index , PCOS – Polycystic Ovary Syndrome, NAFLD – Non-Alcoholic Fatty Liver Disease, CAD – Coronary Artery Disease, CV disease – Cardiovascular Disease, MEN type 2 – Multiple Endocrine Neoplasia Type 2, GI – Gastrointestinal, FBS – Fasting Blood Sugar, PPBS – Postprandial Blood Sugar , HbA1c – Glycated Hemoglobin, eGFR – Estimated Glomerular Filtration Rate, SGOT – Serum Glutamic Oxaloacetic Transaminase (AST – Aspartate Aminotransferase), SGPT – Serum Glutamic Pyruvic Transaminase (ALT – Alanine Aminotransferase), ALP – Alkaline Phosphatase, TC – Total Cholesterol, LDL – Low-Density Lipoprotein, HDL – High-Density Lipoprotein, TG – Triglycerides, TSH – Thyroid-Stimulating Hormone, T4 (Free T4) – Free Thyroxine, ECG – Electrocardiogram

Further, Across the STEP clinical trial program (STEP 2, STEP 4, STEP 5 [104-week phase 3], and STEP-UP), once-weekly Semaglutide 2.4 mg consistently achieved mean weight loss of ~15–18%, with greater reductions of ~19–21% seen with the 7.2 mg dose in STEP-UP.[33,34,38,39]

OBESITY MANAGEMENT DURING A WOMAN'S LIFE COURSE

PRACTICE POINTS

For adolescents aged ≥12years with persistent obesity (BMI ≥95th percentile) who do not achieve adequate response to intensive lifestyle therapy, pharmacotherapy may be considered as an adjunct to ongoing lifestyle interventions. (Level A, Class I)

GLP-1 receptor agonists such as once-weekly subcutaneous Semaglutide 2.4 mg, along with lifestyle changes, can be considered in appropriate adolescents aged 12–18 years as part of a comprehensive obesity management plan to improve cardiometabolic parameters. (Level A, Class I)

Adolescents receiving anti-obesity medications should undergo regular monitoring of weight trajectory, treatment response, gastrointestinal tolerability, metabolic parameters, and normal growth and pubertal development to ensure safe long-term management. (Level A, Class I)

In adolescents

Discussion

Adolescents with obesity have a higher prevalence of associated comorbidities and are at increased risk of persistent obesity in adulthood, leading to greater morbidity and premature mortality. Evidence has shown that obesity significantly increases the risk of comorbid conditions, while weight-loss interventions can effectively improve these health outcomes. Although intensive health behavior and lifestyle treatment (IHBLT) has proven to be very effective for weight management, it is essential to consider pharmacotherapy as an adjunct for adolescents who require further support in managing obesity.[40]

Various Indian and International guidelines recommend the use of pharmacotherapy as part of the management strategy for obesity in adolescents. According to the Indian Academy of Pediatrics guidelines, pharmacotherapy may be considered in adolescents aged ≥12 years when structured lifestyle interventions have not achieved adequate weight reduction or when obesity-related comorbidities are present.[41]

The American Academy of Pediatrics recommends considering weight-loss pharmacotherapy for adolescents aged ≥12 18 years with obesity (BMI ≥95th percentile), based on the medication's indications, risks, and benefits, as an adjunct to comprehensive health behavior and lifestyle treatment.[40]

The Endocrine Society suggests FDA–approved pharmacotherapy for obesity only with a concomitant lifestyle modification program of the highest intensity available for adolescents.[42]

GLP-1RAs offer a promising option for the effective management of obesity in adolescents. While

lifestyle modification and dietary therapy remain the cornerstone of treatment, evidence demonstrates that GLP-1RAs can provide additional benefit for children who do not achieve adequate weight reduction with lifestyle and dietary measures alone. Semaglutide is an approved GLP-1RAs for the treatment of obesity in adolescents aged 12–17 years.[43]

The STEP TEENS Trial (phase 3a; n=201) demonstrated that once-weekly subcutaneous Semaglutide 2.4 mg in adolescents aged 12–18 years, administered alongside lifestyle intervention, resulted in significantly greater reductions in absolute BMI, BMI expressed as a percentage of the 95th percentile, absolute body weight, and percentage body weight at week 68 compared with placebo.[44]

- The estimated mean percentage change in BMI from baseline to week 68 was −16.1% with Semaglutide vs. 0.6% with placebo (95% confidence interval [CI], −20.3 to −13.2; p<0.001).
- At week 68, 76%, 62%, 53%, and 37% of adolescents on Semaglutide achieved ≥5%, ≥10%, ≥15%, and ≥20% reductions in BMI, respectively, compared with 23%, 8%, 5%, and 3% in the placebo group.
- At week 75, in those who continued lifestyle intervention, the BMI remained below baseline in the Semaglutide group and above baseline in the placebo group. The change from baseline was −13.2% in the Semaglutide group and +1.2% in the placebo group (95% CI, −17.8 to −11.0).
- Throughout the study period, treatment was generally well tolerated, with predominantly mild gastrointestinal adverse effects and no observed adverse effects on growth or pubertal development.
- Semaglutide exerts cardiometabolic benefits, including reductions in waist circumference, glycated haemoglobin, alanine aminotransferase, and unfavourable lipid parameters (total cholesterol, low-density lipoprotein-cholesterol [LDL-C], very low-density lipoprotein [VLDL], and triglycerides).

Once-weekly subcutaneous Semaglutide 2.4 mg, combined with lifestyle changes, significantly reduced BMI in adolescents with obesity and improved cardiometabolic markers.[44]

IN REPRODUCTIVE-AGED WOMEN (INFERTILITY, PCOS, PRECONCEPTION, PREGNANCY AND POST-PARTUM)

PRACTICE POINTS

Clinicians should counsel the patients that obesity is associated with reduced natural fertility, lower pregnancy and live birth rates, increased maternal and fetal complications, poorer responses to fertility treatments, and encourage weight loss in those seeking conception. (Level A, Class I)

Weight management is central in women with obesity and PCOS, and therapies such as GLP-1 receptor agonists may improve metabolic health, hormonal balance, and reproductive outcomes. (Level A, Class I)

Evidence from the STEP trial program demonstrates substantial participation of women and shows that Semaglutide can achieve significant weight loss, of ≥15% in phase III trials. (Level A, Class I)

In women with obesity and PCOS who have an inadequate response to lifestyle interventions, Semaglutide may be considered as an adjunct pharmacologic option for weight management. (Level A, Class I)

Semaglutide therapy in obese women with PCOS has been associated with significant reductions in body weight and insulin resistance, along with improvement in menstrual regularity and increased pregnancy rates. (Level A, Class I)

GLP-1 receptor agonists are discontinued 1–2 months prior to conception; women of reproductive age require counseling on effective contraception and pregnancy planning during treatment. (Level A, Class I)

Discussion

Impact of obesity on female reproductive health

Obesity and maternal-fetal complications

The hypothalamic–pituitary–ovarian (HPO) axis plays a central role in female reproductive physiology by regulating menstrual cycles and ovulation. Obesity disrupts this axis, partly through elevated leptin levels, leading to impaired menstrual cyclicity and ovulatory dysfunction.[45] Severely obese women have been reported to have about a 3.1-fold higher risk of menstrual disturbances compared with normal-weight women. Additionally, obesity is associated with an increased risk of spontaneous abortion, observed after both natural conception and medically assisted reproduction, indicating a higher likelihood of miscarriage irrespective of the mode of conception.[46]

In obese women, a combination of reduced implantation rates, increased miscarriage rates, and a higher incidence of pregnancy complications affecting both mother and fetus can cause poor reproductive outcomes in both natural and assisted conception cycles. These effects are majorly linked to underlying endocrine and metabolic disturbances, including alterations in steroid metabolism and dysregulation of hormones such as insulin, leptin, resistin, ghrelin, and adiponectin. Such hormonal changes can impair follicular development, corpus luteum function, early embryonic development, trophoblast activity, and endometrial receptivity. Additionally, obesity is associated with hormonal alterations that adversely affect endometrial function and embryo implantation and may promote abnormal endometrial proliferation, leading to endometrial hyperplasia.[46]

Women with obesity who conceive are also at greater risk for gestational diabetes and an increased risk of

fetal macrosomia. The risk of preeclampsia is observed to double in overweight women, and triple in obese women, with further increased risk with severity of obesity.[47]

Pregnant women with obesity are more likely to experience a prolonged duration of labour, and is also associated with a higher incidence of fetal distress, instrumental deliveries, and shoulder dystocia. In addition, the rate of caesarean section increases significantly with rising BMI. Maternal complications such as wound infection and dehiscence, postpartum hemorrhage, and deep vein thrombosis (DVT) are also more common.[47]

Obesity, risk of infertility, and fertility treatments

Obesity also reduces natural fertility even in ovulatory women, prolonging the time to conception.[47] Obesity is associated with lower pregnancy rates in sub-fertile ovulatory women.[48] Clinical pregnancy and live birth rates are reported to be 15–30% lower in obese women compared with non-obese patients, with outcomes declining further as the severity of obesity increases.[47]

Several large retrospective Assisted Reproductive Technology (ART) datasets (1,721–8,145 women) confirm that obesity impairs ovarian responsiveness to gonadotropin stimulation (increased duration, amount of gonadotropin administered, increased cycle cancellation; and fewer oocytes retrieved).[49]

In one prospective study, pre-treatment with a short-acting GLP-1 receptor agonist before IVF was associated with improved embryo implantation rates. The authors proposed that the drug's anti-inflammatory effects may enhance endometrial receptivity and support implantation.[50]

Obesity and PCOS

Obesity and PCOS are common metabolic disorders associated with subfertility. Both conditions can impair endometrial receptivity during implantation through metabolic disturbances such as altered glucose metabolism, hyperinsulinemia, and hyperandrogenism, which disrupt decidualization. These changes may hinder proper embryo implantation, increasing the risk of miscarriage and infertility. A retrospective analysis of women with PCOS undergoing ovulation induction reported significantly higher miscarriage rates in obese women (BMI > 28 kg/m^2) compared with normal-weight women (60% vs 27%).[46]

Therefore, obesity adversely affects reproductive function at multiple levels, including the ovary and the endometrium, affecting a large proportion of women of reproductive age. It is therefore essential to implement preventive strategies against obesity in young women and promote effective weight management to improve the safety and success of both natural conception and fertility treatments.[46,47]

GLP-1 receptor agonists are a promising therapeutic option for obese women with PCOS. Beyond weight loss, they target mechanisms underlying insulin resistance. GLP-1 receptor agonists may enhance fertility through two pathways: (1) reducing hypothalamic–pituitary suppression driven by obesity-related estrogen excess, restoring luteinizing hormone (LH) levels; and (2) decreasing elevated LH levels associated with hyperinsulinemia and obesity.[51]

Management of obesity in reproductive-aged women

The Semaglutide Treatment Effect in People with obesity (STEP) trial programme was designed to comprehensively explore the efficacy of once-weekly subcutaneous Semaglutide 2.4 mg in people with overweight or obesity. It was found that >50% of the participants enrolled across all trials were women, STEP 1 (weight management; 74.1%), STEP 2 (weight management in type 2 diabetes; 50.9%) STEP 3 (weight management with intensive behavioral therapy [IBT]; 81%), STEP 4 (sustained weight management; 79%),

STEP 5 (2-year weight management; 77.4%), and STEP 6 (Semaglutide vs. liraglutide (Semaglutide/liraglutide/placebo; 81/76.4/77.6%).[52]

Further, in the sex differences sub-study, researchers found that the females experienced greater reduction in risk of adverse cardiovascular outcomes compared to males, when treated with Semaglutide.[53]

In the American Association of Clinical Endocrinology (AACE) 2025 consensus notes that second-generation anti-obesity medications such as Semaglutide achieve, on average, ≥15% weight loss in phase III trials of obese women.[35]

The 2023 International Evidence-Based Guideline published by the American Society of Reproductive Medicine (ASRM) for the Assessment and Management of PCOS emphasize lifestyle intervention and weight management as core components of care, within a broader framework of long-term management addressing metabolic, cardiovascular, reproductive, and psychological risks. Semaglutide can be considered in addition to lifestyle intervention for the management of higher weight in adults with PCOS.[54]

A study assessed Semaglutide 0.5 mg subcutaneously once weekly for 3 months in obese PCOS patients who did not respond to lifestyle modifications. After 3 months, nearly 80% achieved at least a 5% weight loss. Even among those who did not reach 5% weight loss, fasting insulin levels decreased, and HOMA-IR improved. Among responders, 80% women experienced restoration of regular menstrual cycles after 6 months of continued treatment. Low-dose Semaglutide was therefore effective in reducing body weight and restoring menstrual regularity in most obese PCOS patients, with minimal side effects.[55]

In another two-year study in women with PCOS treated with Semaglutide plus metformin, it was found that Semaglutide treatment in PCOS women with obesity led to significant weight loss with sustained metabolic and hormonal improvements, and most benefits extended even 2 years after stopping the treatment.[56]

In a study including overweight or obese women with PCOS, Semaglutide 1 mg weekly + metformin 1000 mg twice daily (16 weeks treatment + 40 weeks pregnancy follow-up) produced greater reductions in body weight, BMI, and waist-to-hip ratio compared with metformin alone (all $p<0.01$). The combination group experienced more frequent menstrual cycle recovery, improved cardiometabolic parameters, and more than double natural pregnancy rates from weeks 16 to 40 (35% vs. 15%, $p<0.05$) vs. the metformin alone group.[51]

In studies where short-acting GLP-1 RAs were discontinued and insulin initiated within 15 weeks of exposure, no fetal malformations, comorbidities, or maternal complications were reported, and neonatal weights were appropriate for gestational age. In Semaglutide registration trials (SUSTAIN 1–6 and STEP 1–5 and 8), pregnancies were exposed briefly until detection; all Semaglutide-exposed women delivered healthy infants, with no reported pregnancy loss or confirmed teratogenic effects.[57]

The American Society of Anesthesiologists (2024) recommends stopping long-acting GLP-1 and/or GIP receptor agonists 7 days before any procedure, regardless of the indication, type of procedure, or planned anesthesia (including both intravenous sedation and general anesthesia).[57]

Experts recommend discontinuing GLP-1 receptor agonists prior to conception, with cessation at least 1–2 months before a planned pregnancy to minimize potential fetal risk.[58]

IN PRE-, PERI-, AND POST-MENOPAUSAL WOMEN

PRACTICE POINTS

Clinicians should recognize that declining estrogen levels during menopause promote a shift toward central fat accumulation and visceral adiposity, which increases cardiometabolic risk. Routine assessment of BMI, waist circumference, and metabolic parameters (DEXA scan) should be considered in peri- and postmenopausal women. (Level B, Class IIa)

Weight management strategies including calorie-restricted diet, regular physical activity, and behavioral support should be the cornerstone of obesity management in menopausal women to improve metabolic health and reduce cardiovascular risk. (Level A, Class IIa)

Anti-obesity medications can be considered in menopausal women with BMI ≥27 kg/m^2 with comorbidities or ≥30 kg/m^2; lower thresholds (>27 kg/m^2) apply in the Indian population when lifestyle measures are inadequate. (Level A, Class I)

GLP-1 and GIP receptor agonists can be considered as a first-line pharmacologic option for obesity management in menopausal women. (Level A, Class I)

Semaglutide can be used as an effective strategy across the pre-, peri-, and post-menopausal groups for weight loss and improvements in other anthropometric measures. (Level A, Class I)

In menopausal women, personalized lifestyle interventions with adequate protein intake are essential to preserve lean mass and prevent sarcopenia. (Level B, Class I)

Discussion

Ovarian estrogens facilitate fat deposition in the gluteal and femoral subcutaneous regions and contribute to glucose homeostasis by modulating insulin secretion and clearance. Estradiol (E2) promotes a peripheral rather than central pattern of fat distribution and improves insulin sensitivity in women. During the menopausal transition, declining E2 levels lead to increased central fat accumulation and visceral adiposity, accompanied by a reduction in lean body mass. This shift toward abdominal and visceral fat increases cardiometabolic risk and mortality in postmenopausal women. Excess abdominal adiposity is closely linked to the development of insulin resistance, type 2 diabetes, hypertension, and carotid atherosclerosis, and is often associated with an unfavorable lipid profile characterized by elevated LDL-C, a reduced total cholesterol to high-density lipoprotein cholesterol ratio, and chronic low-grade inflammation.[59]

Weight loss improves cardiometabolic health and reduces the risk of CVD and mortality. As CVD is the leading cause of death in women, and menopause independently increases this risk, preventing weight gain and effectively managing overweight and obesity are essential in women.[60]

Pharmacologic therapy serves as an important adjunct to lifestyle modification in the management of obesity in menopausal women, particularly those with a BMI >27 kg/m^2 with comorbidities or >30 kg/m^2; lower thresholds (>27 kg/m^2) are considered for the Indian population.[8,61] The emergence of GLP-1 and dual glucose-dependent insulinotropic polypeptide (GIP) receptor agonists, such as Semaglutide and tirzepatide, marks a major advance in obesity treatment, offering effective and well-tolerated options with significant cardiometabolic benefits. These therapies should be combined with a hypocaloric diet, regular physical

activity, and appropriate clinical support. Among them, once-weekly Semaglutide 2.4 mg is considered a first-line option due to its potent weight-loss efficacy and demonstrated cardiovascular benefits.[61]

The International Menopause Society acknowledges GLP-1 RAs, such as Semaglutide, as an effective weight-loss therapy that enhance satiety and promote significant weight reduction.[62]

In a retrospective cohort study of 106 postmenopausal women, Semaglutide with hormone therapy for 12 months was associated with an improved weight loss response and cardiometabolic risk markers.[60]

The STEP (Step 1, 3, 4, 5, 8, and 9 once-weekly subcutaneous Semaglutide 2.4 mg for 68 weeks pooled data) and OASIS 4 (once-daily oral Semaglutide 25 mg for 64 weeks) post hoc analysis has shown that all menopausal groups (pre- peri- and post-) achieved significant weight loss and improvements in other anthropometric measures with Semaglutide. Weight loss achieved with Semaglutide across the pre-, peri-, and post-menopausal groups was consistent with that reported in the full populations of the STEP and OASIS 4 trials.[63]

In perimenopausal and postmenopausal women, assessment of muscle mass for sarcopenia is essential before considering medical or surgical management. Personalized lifestyle interventions with adequate protein intake are key to preserving lean mass and preventing sarcopenia.[20,61]

SAFETY, PRECAUTIONS, AND DISCONTINUATIONS OF AOMS

PRACTICE POINTS

Patients should be counseled regarding potential gastrointestinal adverse effects, along with practical dietary strategies to improve tolerability. (Level A, Class I)

GLP-1 receptor agonists are contraindicated in patients with a personal or family history of medullary thyroid carcinoma, MEN2, or known hypersensitivity. (Level A, Class IIa)

GLP-1 receptor agonists require caution in patients with a history of pancreatitis, gallbladder disease, or gastroparesis; baseline assessment of glycemic status, renal function, and diabetic retinopathy is recommended prior to initiation. (Level B, Class IIa)

Women of reproductive age are advised to use effective contraception during therapy and discontinue Semaglutide at least 2 months prior to a planned pregnancy. (Level B, Class I)

GLP-1 receptor agonists are not recommended during breastfeeding due to limited safety data. (Level A, Class I)

Semaglutide does not result in clinically significant pharmacokinetic interactions with combined oral contraceptives and does not compromise contraceptive efficacy. (Level A, Class I)

Combined oral contraceptives containing drospirenone and low-dose ethinyl estradiol provide effective long-term contraception, with added benefits of improving PMDD and moderate acne. (Level A, Class IIa)

Discussion

During therapy with GLP-1 receptor agonists, patients should be advised to maintain adequate protein intake and engage in resistance or strength-training exercises to help preserve lean body mass during weight loss. They should also be counselled about potential gastrointestinal adverse effects and guided on practical dietary strategies that may help minimize these symptoms.[35]

GLP-1 receptor agonists are contraindicated in women with a personal or family history of medullary thyroid carcinoma or multiple endocrine neoplasia type 2, and in those with prior hypersensitivity to these agents.[64]

Caution is advised in women with a history of pancreatitis, gallbladder disease, or gastrointestinal motility disorders such as gastroparesis. Baseline assessment of glycemic status, renal function, and diabetic retinopathy (in women with diabetes) is recommended before initiation.[64]

Women of reproductive age should use effective contraception during therapy and discontinue agents such as Semaglutide at least two months before a planned pregnancy.[58]

GLP-1 receptor agonists are large protein molecules with minimal expected transfer into breast milk, and any ingested amount is likely degraded in the infant's gut. However, due to limited human safety data, their use is generally avoided during breastfeeding.[58]

Discontinuation strategy for Semaglutide in weight management

- Avoid abrupt cessation of Semaglutide to minimize the risk of significant weight regain.[65]
- Gradual dose tapering is recommended when discontinuing Semaglutide.[65]
- Continuation of lifestyle interventions and appropriate clinical monitoring is advised during and after Semaglutide discontinuation.[65]

Use of Semaglutide with OCPs

Oral and once-weekly subcutaneous Semaglutide do not produce clinically significant pharmacokinetic interactions with Ethinylestradiol or Levonorgestrel, indicating that Semaglutide does not compromise the contraceptive efficacy of combined oral contraceptives.[66] Therefore, the combined oral contraceptive pill (COC) consisting of drospirenone 3 mg/ethinyl estradiol 20 µg can be used and are shown to provide effective long-term contraception (~99% efficacy) along with additional clinical benefits, including improvement in Premenstrual Dysphoric Disorder (PMDD) and moderate acne.[67]

Drospirenone, a fourth-generation progestin with progestogenic, anti-mineralocorticoid, and antiandrogenic properties, may also reduce sodium and water retention via the renin–angiotensin–aldosterone system, thereby helping decrease bloating, weight gain, and blood pressure. Consequently, low-dose drospirenone/ethinyl estradiol formulations may have therapeutic roles beyond contraception in conditions affecting quality of life.[67]

Patient counselling and considerations for clinicians

- Medical therapy should be considered when lifestyle interventions alone are insufficient to achieve or sustain weight loss.[68]
- Several anti-obesity medications approved by the U.S. Food and Drug Administration; such as Semaglutide, liraglutide, phentermine-topiramate, orlistat, and naltrexone-bupropion have demonstrated effectiveness for obesity management.[68]
- Among these, Semaglutide shows the greatest weight-loss efficacy, although tolerability and the need for subcutaneous administration may influence adherence.[68]
- Pharmacotherapy should be individualized based on comorbidities, age, sex, and patient preferences.[68]
- Despite concerns regarding adverse effects and long-term safety, current evidence supports

the use of these agents, and clinicians should consider obesity as a chronic disease requiring individualized medical management.[68]

Awareness, and prevention of obesity

Management of obesity through proactive action and patient awareness is recognized as an important strategy for both prevention and long-term control of obesity, with emphasis on early identification, patient education, and sustained lifestyle interventions.[69] This approach termed Managing Obesity Through Action and Patient Awareness (MOTAPA) reflects a shift toward comprehensive, patient-centered, and lifestyle-focused obesity management. The acronym also resonates in the Indian context, where "motapa" is a commonly used term for obesity, reinforcing an action-oriented framework for improving awareness and management.

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