Clinical studies on anti-obesity medications in Arab countries

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ABSTRACT

الأهداف: تحديد وتلخيص الدراسات التي أُجريت في الدول العربية حول أدوية مكافحة السمنة، مع التركيز على أنواع الأدوية التي تم تناولها، وتصميم الدراسات، ومقاييس الفعالية والسلامة التي تم الإبلاغ عنها.

المنهجية: أجرينا مراجعة استكشافية شاملة للدراسات الأولية التي تناولت استخدام أدوية مكافحة السمنة لدى البالغين في الدول العربية. تم البحث في خمسة قواعد بيانات: Medline، وEmbase، ومكتبة كوكرين، والفهرس الطبي لإقليم شرق المتوسط، وقاعدة معرفة، عن الدراسات المنشورة باللغة الإنجليزية حتى 4 أكتوبر 2024م. قام مراجعان مستقلان باستخراج البيانات المتعلقة بخصائص الدراسات، والخصائص الديموغرافية للمشاركين، والتدخلات، والنتائج المرتبطة بخفض الوزن، والمعايير الأيضية، والآثار الجانبية. وقد تم تقييم خطر الانحياز باستخدام مقياس نيوكاسل-أوتاوا للدراسات غير العشوائية، وأداة تقييم خطر الانحياز المعدّلة للتجارب السريرية العشوائية المحكمة.

النتائج: اشتملت على 59 دراسة سريرية نُشرت بين عامي 2014م و2024م، وكانت الغالبية منها (89.8%) ذات تصميم رصدي. أُجريت معظم الدراسات في المملكة العربية السعودية (40.7%) والإمارات العربية المتحدة (20.3%). تناولت 72.9% من الدراسات ناهضات مستقبل الببتيد المشابه للجلوكاجون-١، وكان عقار الليراجلوتيد هو الأكثر دراسة (54.2%). و من بين أكثر مؤشرات الفعالية التي تم الإبلاغ عنها: التغير في الوزن الكلي للجسم (45.8%)، و مؤشر كتلة الجسم (39.0%)، و نسبة فقدان الوزن (28.8%). كما تم الإبلاغ عن آثار جانبية في الجهاز الهضمي لدى 32.2% من المرضى.

الخلاصة: على الرغم من تزايد عدد الأبحاث حول أدوية مكافحة السمنة في الدول العربية، فإن معظم الدراسات لا تزال رصدية و تركز بشكل أساسي على الأدوية من الجيل السابق. هناك حاجة إلى إجراء تجارب سريرية عشوائية محكمة لتقييم فعالية و سلامة أدوية مكافحة السمنة الأحدث، مثل السيماغلوتيد والتيرزيباتيد، لدى السكان العرب، بهدف تطوير استراتيجيات علاجية تتماشى مع الخصائص الثقافية و الوراثية.

Objectives: To identify and summarize studies carried out in Arab countries on anti-obesity medications (AOMs), with a focus on the types of medications investigated, study designs, and the efficacy/effectiveness and safety metrics reported.

Methods: We carried out a comprehensive scoping review of primary studies examining the use of AOMs in adult Arab populations. Five databases (Medline, Embase, Cochrane Library, Index Medicus for the Eastern Mediterranean Region, and e-Marefa) were searched for English-language publications up to October 2024. Data extraction was carried out on study characteristics, participant demographics, interventions, and outcomes related to weight reduction, metabolic parameters, and side effects. The risk of bias (RoB) was assessed using the Newcastle-Ottawa scale for non-randomized studies and a modified RoB tool for randomized controlled trials.

Results: A total of 59 clinical studies published between 2014-2024 were included. The majority (89.8%) were observational in design. Most studies were carried out in Saudi Arabia (40.7%) and the United Arab Emirates (20.3%). Glucagon-like peptide-1 receptor agonists were investigated in 72.9% of the studies, with liraglutide being the most frequently studied agent (54.2%). The most commonly reported efficacy outcomes included changes in total body weight (45.8%), body mass index (39.0%), and the proportion of weight loss (28.8%). Gastrointestinal side effects were reported in 32.2% of patients across studies.

Conclusion: Despite the growing body of research on AOMs in Arab countries, most studies remain observational and focus primarily on earlier-generation agents. There is a need for randomized controlled trials to evaluate the efficacy and safety of newer AOMs, such as semaglutide and tirzepatide, within Arab populations to inform culturally and genetically tailored obesity management strategies.

Keywords: obesity, anti-obesity medication, arab countries, scoping review

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Obesity affects approximately 2.5 billion adults globally and presents a significant public health challenge. The Middle East, particularly Saudi Arabia, has a notable prevalence of overweight/obesity, with 38% of adults being overweight and 20% being obese, as reported in a 2019 World Health Organization (WHO) survey.[1,2] Obesity not only predisposes individuals to a range of serious health issues, including metabolic and cardiovascular diseases but also imposes a significant economic burden.[3,4] The etiology of obesity is complex and influenced by genetic, environmental, behavioral, and sociocultural factors, which complicates its management.[5,6]

Arab populations exhibit a distinct genetic susceptibility to obesity, likely exacerbated by consanguinity, which is highly prevalent in many Arab countries. A systematic review identified 76 genetic variants associated with obesity in these populations, of which 2 are unique, and 19 show specific associations compared with non-Arab groups.[7-9] These genetic variants can significantly influence drug metabolism by altering the activity of drug-metabolizing enzymes, leading to variations in drug efficacy and toxicity.[8,10-12]

The United States (US) Food and Drug Administration (FDA) has approved various pharmacotherapies, such as liraglutide and semaglutide, which, when integrated with lifestyle modifications, can be very effective in reducing body weight.[13,14] However, the specific impact of these medications on the Arab population requires further investigation to ensure optimal treatment efficacy.[15] Despite the relatively early stage of obesity pharmaceutical research in Arab countries, there is an increasing focus on this area. Effective pharmacotherapy, which is essential for managing obesity where lifestyle modifications alone are insufficient, must be adapted to the unique genetic and environmental contexts of Arab populations to improve long-term outcomes.[15]

With this scoping review, we aimed to provide a comprehensive description of the body of evidence on the use of anti-obesity medications (AOMs) among adults in the Arab world. The results of this scoping review will help inform future research initiatives in the Arab world.

Objectives. To summarize the characteristics of the studies carried out in Arab countries such as the type of medication, the research setting, the duration of intervention investigated, the primary outcome reported, and to compare these characteristics across studies by type of AOM. Additionally, we aimed to assess the diversity of study designs and methodologies used in this research area, and to identify and map all relevant medications.

Disclosure. Authors have no conflict of interests, and the work was not supported or funded by any drug company.

Methods.

We adhered to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) extension for scoping reviews statement.[16]

Eligibility criteria. We included clinical studies examining the use of AOMs in adults within Arab countries. We included studies of any design except narrative, systematic reviews, clinical guidelines, correspondence, or studies investigating irrelevant interventions. We excluded studies on participants under the age of 18, non-Arab populations, and multi-site clinical studies initiated outside Arab countries.

Information sources and search strategy. We systematically searched 5 databases: Ovid Medline, Embase, the Cochrane Library, Index Medicus for the Eastern Mediterranean Region, and e-Marefa. The search strategy was developed using key concepts related to our research objective: the use of AOMs in Arab countries. These concepts included AOMs, overweight, obesity, and weight management interventions in adult populations within the Arab world (Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, the United Arab Emirates [UAE], and Yemen). We employed Medical Subject Headings (MeSH) terms and Boolean operators to ensure comprehensive coverage of the literature. The search was limited to English-language studies and included publications from inception through October 2024. Further details of the search strategy are shown in **Appendixes 1 & 2**.

Study selection. Reviewers used the Covidence systematic review software (Veritas Health Innovation, Melbourne, Australia) to organize and facilitate the study selection process.[1] Two reviewers, independently and in duplicate, screened the titles and abstracts of the identified studies, excluding irrelevant studies. Subsequently, 2 independent reviewers assessed the full texts of potentially eligible articles and extracted relevant data from the eligible studies. Any disagreements among the reviewers were resolved by a third reviewer. The PRISMA flow diagram outlining the study selection process is presented in **Figure 1**.

Data extraction. Two authors independently extracted data using a standardized, predesigned data extraction form. The extracted data included

study characteristics (author, publication year, study design, and sample size), participant demographics and baseline characteristics (country, percentage of female participants, mean age, and population/diagnosis), intervention details (type of AOM, dosage, duration, route of administration, and frequency of administration), and information on which outcome metrics were reported.

Outcome measures. Our scoping review focused on identifying which outcomes were reported in the included studies. These outcomes included but were not limited to weight-related measures (for example, change in total body weight [TBW], body mass index [BMI], waist circumference [WC], metabolic parameters [namely, blood glucose levels, lipid profiles, and blood pressure], and side effects associated with AOMs). For side effects, this review collected the proportion of patients experiencing gastrointestinal (GI) symptoms in studies that reported them. Gastrointestinal side effects were defined as any GI-related symptoms reported. Gastrointestinal side effects with additional symptoms were defined if any additional symptoms were reported, such as headache or fatigue. Serious complications were defined as acute pancreatitis, intragastric balloon migration leading to small bowel obstruction (SBO), or other serious complications, as specified by the study's authors. The outcome measures were documented and categorized pragmatically by merging similar outcomes into broader categories to facilitate reporting (namely, patient-reported outcomes [PROs], biomarkers and biochemical effects, cardiometabolic outcomes, health behaviors/practices, and health economics).

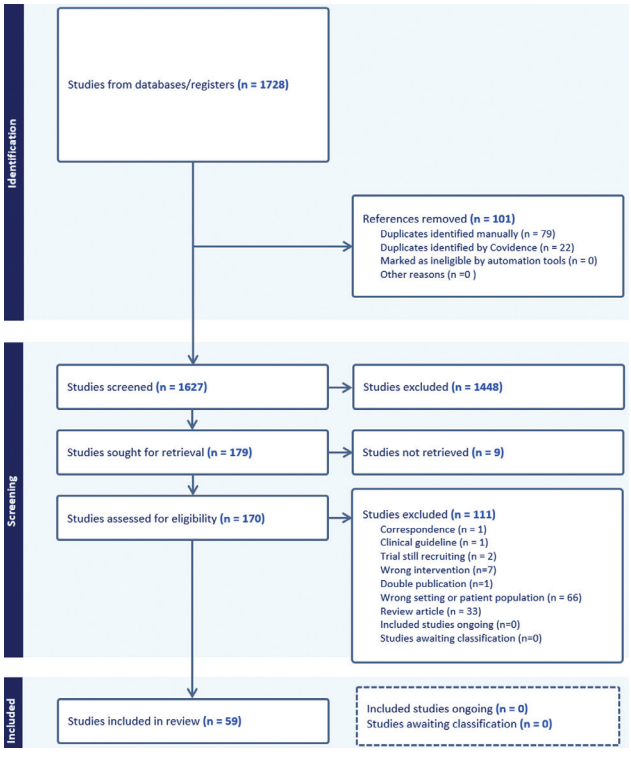

Figure 1 - The Preferred Reporting Items for Systematic reviews and Meta-Analyses flowchart diagram showing the study selection steps.

Risk of bias assessment. For non-randomized studies, we utilized the Newcastle-Ottawa scale (NOS) to assess the risk of bias (RoB).[17] This scale evaluates studies based on the selection of the study groups, comparability of the groups, and ascertainment of the outcome/exposure.[17] For randomized controlled trials (RCTs), we applied the revised Cochrane risk-of-bias tool for randomized trials (RoB 2), assessing domains such as randomization, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported result.[18] The risk of bias assessment was carried out independently and in duplicate by 2 reviewers. Each domain was rated to provide a comprehensive evaluation of the RoB for each study. Discrepancies between reviewers were resolved through discussion and consensus or by consulting a third reviewer if necessary.

Data synthesis. We summarized and presented the data descriptively according to the type of medication, country, duration of the intervention, and the outcomes reported. We evaluated the diversity of study designs and methodologies used in research carried out on the use of AOMs.

Statistical analysis. Descriptive statistics were used to summarize the data. For categorical variables, absolute frequencies and percentages (%) were calculated, whereas continuous variables were summarized using medians with interquartile ranges (IQRs) and range values. Statistical analyses were carried out using the statistical Package for the Social Sciences, version 29.0 (IBM Corp., Armonk, NY, USA). For quantifying the frequency of AOMs studied, some studies were counted more than once if they included multiple types of AOMs to provide a comprehensive overview of the medications studied.

Results. Out of 1627 titles, 170 were assessed for eligibility, 111 were excluded for various reasons (Figure 1), and 59 studies met our eligibility criteria and were included. Eligible studies were published between 2014-2024 (Figure 2). Among these, 12 studies (20.3%) were published as abstracts and 47 studies (79.7%) were published as full texts.[20-78] The detailed characteristics of these studies are provided in Table 1.

The 53 observational (non-randomized) studies accounted for 89.8% of the total, with 11 (18.6%) studies including control arm (6 observational and 5 RCTs). Most studies originated from Saudi Arabia (39%) and the UAE (20.3%, Table 2). Funding was reported in 22.0% of the studies. The median sample size was 91 (IQR: 50-180), with a median participant age of 43.0 years (IQR: 37.7-48.0). The median proportion of females in the included studies was 71.0% (IQR: 55.2-81.0%).

The primary outcomes that were reported across eligible studies were changes in TBW (45.8%), BMI (39.0%), weight loss proportion (28.8%), and WC (6.8%). Approximately 36% of the studies reported multiple anthropometric measures. Cardiometabolic outcomes included changes in hemoglobin A1c (HbA1c, 20.3%) and lipid profile (10.2%).

Risk of bais assessments, where applicable (excluding abstracts and cost-effectiveness analyses), revealed that among the 41 observational (non-randomized studies), 53.7% had moderate RoB, 2.4% low RoB, and 43.9% high RoB. Four of the 6 (66.7%) RCTs were classified as having high RoB, and 2 (33.3%) were classified as having low RoB. Details on the study characteristics, interventions, and outcomes can be found in Tables 1 & 2.

Figure 3 displays a geographic heatmap that visualizes the distribution of AOM clinical studies across the Arab world, providing insight into the regional variation in research activity related to AOMs.

Glucagon-like peptide-1 (GLP-1) receptor agonists were investigated in 43 (72.9%) studies (Figure 4), with liraglutide being the agent used in 54.2% of all studies. Other GLP-1 receptor agonists included semaglutide (20.3%), dulaglutide (6.8%), and exenatide (3.4%). Tirzepatide (dual glucose-dependent insulinotropic polypeptide [GIP]/GLP-1 agonists) was used in 8.5% of the studies. Orlistat (13.6%) and metformin (8.5%) were among the non-GLP-1 agents studied. Naltrexone/bupropion and lorcaserin/phentermine were each used in one study. In studies investigating GLP-1 receptor agonists only, TBW was reported in 56.4%, BMI in 35.9%, and weight loss proportions in 33.3%. Changes in HbA1c were reported in 25.6% and the lipid profile in 5.1% of GLP-1 studies. Studies of dual GIP/GLP-1 agonists reported TBW (40.0%) and weight loss proportions (40.0%). Non-GLP-1 studies reported BMI (58.3%), TBW (25.0%), weight loss proportion (16.7%), WC (16.7%), HbA1c (8.3%), and lipid profile (33.3%).

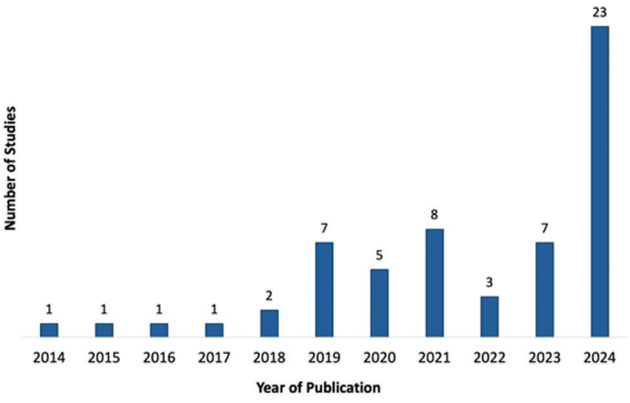

Figure 2 - Anti-obesity medication study counts by year of publication (N=59).

Whether patients experienced GI side effects with additional symptoms was reported in 15.3% of the studies; reporting of GI side effects with serious complications was reported in 6.8% (exclusively among GLP-1 receptor agonist studies). Overall, 78.0% of the studies were published between 2020-2024, with all dual GIP/GLP-1 studies published in 2024. Cohort studies represented 74.4% of GLP-1 studies, 60.0% of dual GIP/GLP-1 studies, and 41.7% of non-GLP-1 studies. Among non-GLP-1 studies, 41.7% were RCTs. Saudi Arabia carried out 48.7% of GLP-1 studies. All dual GIP/GLP-1 studies were from the UAE (60.0%) and Kuwait (40.0%). Among the GLP-1 studies, 46.2% of the population focused on individuals with obesity only, while 20.5% specifically evaluated those with type 2 diabetes only. Other studies included participants with both obesity and type 2 diabetes, or combined these conditions with others, such as bariatric surgery, dyslipidemia, or metabolic dysfunction-associated steatotic liver disease (MASLD).

Discussion. The current scoping review examines the evidence surrounding the use of AOMs in clinical practice in Arab nations. Most of the studies included were retrospective observational cohort studies, whereas only 6 were RCTs, all of which were non-GLP-1 AOM studies. Globally, research on AOMs is more extensive, with numerous funded high-quality RCTs demonstrating their efficacy and safety.[79,80] This discrepancy could be attributed to many challenges in carrying out high-quality RCTs among Arab countries, including inadequate research resources such as limited funding opportunities, an underdeveloped regulatory framework, inadequate research facilities, and a lack of skilled personnel.[81,82] Despite the limitations of the currently available knowledge in the literature from Arab countries, the number of included publications has notably increased since 2018, highlighting the growing positive clinical attitudes toward treating obesity. The

Table 1 - Characteristics of the studies included in this scoping review.

Authors	Countries	Study designs	Sample sizes	Female (%)	Age (yrs)	Population/ diagnosis	Anti-obesity medication (intervention)	Duration of intervention (months)	Route of AOM administration	Dosage of AOM	Frequency of AOM	Primary outcome(s)	Risk of bias (RoB)
Non-randomized studies (n=53)													
Bashier et al[32]	UAE	Retrospective cohort study	54	74.0%	50.6±11.1	Adult/ T2DM	Exenatide	6.0	Subcutaneous	0.005-0.01 mg	Twice daily	Effect on anthropometric parameters (TBW); effect on cardiometabolic indices (HbA1c)	Moderate
Bashier et al[33]	UAE	Prospective cohort study	463	71.0%	50.4±10.0	Adult/ T2DM	Liraglutide	6.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW); effect on cardiometabolic indices (HbA1c)	Moderate
Mosli et al[34]	Saudi Arabia	Retrospective cohort study	108	71.3%	33.7±9.1	Adult/ obesity undergone bariatric surgery	Liraglutide	6.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW and BMI)	Low
Alharbi et al[25]	Saudi Arabia	Prospective cohort study	45	-	51.5±12.9	Adult/ T2DM	Liraglutide	6.0	Subcutaneous	0.6-1.8 mg	Once daily	Effect on anthropometric parameters (TBW); effect on cardiometabolic indices (HbA1c and BP)	N/A‡
Shaghouli et al[21]	Kuwait	Retrospective case series	-	-	-	Adult/ T2DM	Liraglutide	15.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW)	N/A‡
Elhag et al[68]	Qatar	Retrospective cohort study	129	86.0%	42.9±10.4	Adult/ obesity	Lorcaserin & phentermine	3.0	Oral	Lorcaserin: 10 mg; phentermine: 37.5 mg	Lorcaserin: twice daily; phentermine: once daily	Effect on anthropometric parameters (TBW, BMI, and weight loss proportion %)	Moderate
Allum et al[20]	UAE	Retrospective cohort study	41	70.7%	37.6±8.1	Adult/ obesity undergone bariatric surgery	Liraglutide	≥4.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW and BMI)	N/A‡
Almarshad et al[69]	Saudi Arabia	Case report	1	0.0%	35	Adult/ obesity	Liraglutide	1.5	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW and BMI)	High
Albarkah et al[35]	Saudi Arabia	Prospective cohort study	38	55.2%	50.6±10.8	Adult/ T2DM	Liraglutide	12.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW); effect on cardiometabolic indices (HbA1c and BP)	High
Buckley et al[36]	UAE	Retrospective cohort study	322	-	-	Adult/ obesity	Liraglutide	13.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (weight loss proportion %)	Moderate
Suliman et al[37]	UAE	Prospective cohort study	2,092	75.0%	38*	Adult/ obesity	Liraglutide	≥4.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (weight loss proportion %)	Moderate
Al Hayek et al[38]	Saudi Arabia	Prospective cohort study	71	53.1%	48.7±10†	Adult/ T2DM, obesity	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Patient satisfaction	High
Khedr et al[39]	Egypt	Pilot of non-randomized controlled trial	160	50.0%	46.4±5.9	Adult/ obesity	Orlistat	2.0	Oral	120 mg	Twice daily for 30 days, followed by once daily for 30 days	Effect on anthropometric parameters (TBW)	Moderate
Allum et al[26]	UAE	Retrospective cohort study	90	65.6%	40±13.5†	Adult/ obesity	NB	3.0	Oral	8/90 mg	Start with once daily, increasing weekly to 4 times daily	Effect on anthropometric parameters (TBW)	N/A‡

Table 1 - Characteristics of the studies included in this scoping review (continuation).

Authors	Countries	Study designs	Sample sizes	Female (%)	Age (yrs)	Population/ diagnosis	Anti-obesity medication (intervention)	Duration of intervention (months)	Route of AOM administration	Dosage of AOM	Frequency of AOM	Primary outcome(s)	Risk of bias (RoB)
Non-randomized studies (n=53)													
Aboddy et al[40]	Iraq	Retrospective cohort study	117	81.1%	-	Adult/ obesity	Metformin, Orlistat	4.0	Oral	500 mg	3 time daily	Effect on anthropometric parameters (BMI and weight loss proportion %)	Moderate
Alshahrani et al[30]	Saudi Arabia	Cross-sectional study	404	28.2%	-	Adult/ obesity	Non-prescribed weight reduction products	-	-	-	-	Assess the relationship between BMI and weight reduction products, specifically focusing on the perceptions and usage patterns of non-prescribed WRPs	N/A‡
Alrowais et al[70]	Saudi Arabia	Cross-sectional study	68	54.4%	54.4±9.5	Adult/ T2DM, obesity	Liraglutide	12.0	Subcutaneous	0.6-1.8 mg	Once daily	Effect on anthropometric parameters (TBW and BMI)	High
Albaker et al[71]	Saudi Arabia	Retrospective cohort study	258	87.0%	37.8±1.0	Adult/ obesity	Liraglutide	≥4	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW)	Moderate
Hussein et al[41]	Egypt	Non-randomized controlled trial	100	100.0%	37.7±11.8	Adult/ obesity	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (BMI, WC, and WHR)	Moderate
Suliman et al[22]	UAE	Prospective cohort study	787	75.0%	38.0*	Adult/ obesity	Liraglutide	≥4	-	-	-	Effect on anthropometric parameters (weight loss proportion %)	N/A‡
Rahmah et al[42]	Iraq	Retrospective cohort study	27	48.1%	48±9.2†	Adult/ T2DM, obesity	Liraglutide	7.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (weight loss proportion %)	Moderate
Aleidi et al[43]	Saudi Arabia, Jordan	Prospective cohort study	101	61.5%	45.3±10.5	Adult/ T2DM, obesity	Metformin	≥6.0	Oral	500 mg	3 times daily	Metabolic changes of long-term use of metformin (Metabolite dysregulation)	Moderate
Moujaes et al[46]	Lebanon	Retrospective cohort study	100	80.0%	41.9±12.5	Adult/ obesity	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW and WC)	Moderate
Elhag et al[44]	Qatar	Retrospective cohort study	145	82.8%	43.3±10.5	Adult/ obesity undergone bariatric surgery	Liraglutide	12.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW, BMI and weight loss proportion %)	Moderate
Alanazi et al[45]	Saudi Arabia	Retrospective cohort study	200	40.0%	53±0.96†	Adult/ T2DM	Orlistat	6.0	Oral	120 mg	Once daily	Effect on anthropometric parameters (BMI); effect on cardiometabolic indices (Lipid panel and BP)	Moderate
Jamal et al[28]	Kuwait	Retrospective cohort study	89	-	-	Adult/ obesity undergone bariatric surgery	Semaglutide	3.0	-	-	-	Effect on anthropometric parameters (TBW, BMI, and weight loss proportion %)	N/A‡
Alshehri et al[72]	Saudi Arabia	Retrospective cohort study	399	74.4%	46.4±12.1	Adult/ obesity	Liraglutide	6.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW and weight loss proportion %)	Moderate
Jamal et al[60]	Kuwait	Retrospective cohort study	57	73.7%	36.7±7.3	Adult/ obesity undergone bariatric surgery	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW and weight loss proportion %)	Moderate

Table 1 - Characteristics of the studies included in this scoping review (continuation).

Authors	Countries	Study designs	Sample sizes	Female (%)	Age (yrs)	Population/ diagnosis	Anti-obesity medication (intervention)	Duration of intervention (months)	Route of AOM administration	Dosage of AOM	Frequency of AOM	Primary outcome(s)	Risk of bias (RoB)
Non-randomized studies (n=53)													
Ajabnoor et al[47]	Saudi Arabia	Retrospective cohort study	72	61.0%	55±8.32†	Adult/ T2DM	Liraglutide or Semaglutide	≥6.0	Subcutaneous	Semaglutide: ≥0.25 mg & liraglutide: 0.6-3.0 mg	Semaglutide: once weekly & liraglutide: once daily dose	Effect on anthropometric parameters (BMI); effect on cardiometabolic indices (HbA1c)	Moderate
Alfadda et al[29]	Saudi Arabia	Prospective cohort study	28	64.0%	36±11.6	Adult/ obesity	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (weight loss proportion %); effect on cardiometabolic indices (HbA1c); effect on CAP score	N/A‡
Allum et al[27]	UAE	Retrospective cohort study	87	76.0%	39.7*	Adult/ obesity	Semaglutide	6.0	Subcutaneous	Average dose: ≥0.5 mg	Once weekly	Effect on anthropometric parameters (weight loss proportion %)	N/A‡
Mawardi et al[48]	Saudi Arabia	Case series	3	100.0%	34±4.8	Adult/ obesity	Semaglutide	1.5, 3.0, 4.0	Subcutaneous	Average dose: 0.5 mg	Once weekly	Possible association with secondary xerostomia	High
Farooqi et al[49]	UAE	Case report	1	100.0%	20	Adult/ obesity	Tirzepatide	1.5	Subcutaneous	2.5-7.5 mg	Once weekly	Possible association with developing DVT	High
Alidrisi et al[50]	Iraq	Prospective cohort study	55	60.0%	46.5±8.7	Adult/ T2DM, obesity	Liraglutide	6.0	Subcutaneous	0.6-1.2 mg	Once daily	Effect on anthropometric parameters (TBW); effect on cardiometabolic indices (HbA1c)	Moderate
Buckley et al[51]	UAE	Retrospective cohort study	3,686	59.2%	54.1±11.5	Adult/ T2DM, obesity	Tirzepatide	10.0	Subcutaneous	2.5-12.5 mg	Once weekly	Effect on cardiometabolic indices (HbA1c)	Moderate
Alorayyidh et al[23]	Saudi Arabia	Prospective cohort study	19	-	-	Adult/ obesity	Liraglutide	13.0	Subcutaneous	0.6-3.0 mg	Once daily	Influence of GLP-1 on liking behavior	N/A‡
Shaghouli et al[24]	Kuwait	Prospective cohort study	91	78.0%	43*	Adult/ obesity	Semaglutide	3.0	Oral		Once daily	Effect on anthropometric parameters (TBW, BMI, and weight loss proportion %)	N/A‡
Alghamdi et al[73]	Saudi Arabia	Case report	1	100.0%	29	Adult/ obesity	Semaglutide & dulaglutide	3.0	Subcutaneous	Semaglutide: Average dose: 0.5 then 1.0 mg & dulaglutide: 1.5 mg	Once weekly	Possible association with developing autoimmune-like hepatitis and cholelithiasis	High
Hussein et al[52]	Saudi Arabia	Cross-sectional study	96	100.0%	-	Adult/ obesity	Liraglutide, semaglutide, and orlistat		Subcutaneous/ oral	Liraglutide: 6 mg; semaglutide: 1 mg; orlistat: 120 mg	Liraglutide: once daily, semaglutide: once weekly, and orlistat: once daily	Frequent use of anti-obesity medication and herbal mixtures among college students	High
Khalaf et al[53]	Saudi Arabia	Cross-sectional study	361	38.5%	28±11.9	Adult/PHC visitors						Evaluate knowledge, perception, and prevalence of anti-obesity medications usage among PHC visitors in Jeddah, Saudi Arabia	High
Alfadda et al[54]	Saudi Arabia	Prospective cohort study	23	65.0%	36±10.9	Adult/ obesity	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect in the plasma metabolome	High
Masood et al[55]	Saudi Arabia	Prospective cohort study	20	-	36±11.1	Adult/ obesity	Liraglutide	3.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect in the plasma metabolome	Moderate
Gad et al[56]	Egypt	Non-randomized controlled trial	180	48.0%	47.3±6.0	Adult/ T2DM, obesity, MASLD	Semaglutide	12.0	Subcutaneous: ozempic; oral: rybelsus	Ozempic: average 0.25-2.0 mg; rybelsus: 3.0 mg with titration	Ozempic: once weekly; rybelsus: once daily	Effect on anthropometric parameters (BMI); effect on cardiometabolic indices (LFT, and Lipid profile); effect on liver fibrosis parameters	Moderate

Table 1 - Characteristics of the studies included in this scoping review (continuation).

Authors	Countries	Study designs	Sample sizes	Female (%)	Age (yrs)	Population/ diagnosis	Anti-obesity medication (intervention)	Duration of intervention (months)	Route of AOM administration	Dosage of AOM	Frequency of AOM	Primary outcome(s)	Risk of bias (RoB)
Non-randomized studies (n=53)													
Albahli et al[57]	Saudi Arabia	Retrospective cohort study	102	55.2%	60.4±8.8	Adult/ T2DM, dyslipidemia	Dulaglutide	3.0	Subcutaneous	1.5 mg	Once weekly	Effect on some cardiometabolic indices (triglycerides and LDL-C levels)	High
Albargawi et al[58]	Saudi Arabia	Retrospective cohort study	205	77.4%	52±10.9	Adult/T2DM	Dulaglutide	12.0	Subcutaneous	1.5 mg	Once weekly	Effect on anthropometric parameters (TBW, and BMI); effect on cardiometabolic indices (HbA1c)	High
Alenzi et al[59]	Saudi Arabia	Retrospective cohort study	363	50.4%	52.6±8.0	Adult/ T2DM, obesity	Semaglutide	12.0	Subcutaneous	Average dose: 0.5 or 1.0 mg	Once weekly	Effect on anthropometric parameters (TBW, and BMI); effect on cardiometabolic indices (HbA1c)	Moderate
El-Mezayen et al[78]	Egypt	Cross-sectional study	462	98.4%	-	Adult/obesity	Liraglutide, orlistat, metformin					Effect on anthropometric parameters (BMI) during COVID-19 pandemic	High
Alshahawey et al[31]	Egypt	Cost effectiveness analysis	-	-	-	Adult/obesity	Semaglutide/ liraglutide	17.0	Subcutaneous	Semaglutide: 2.4 mg; Liraglutide: 3.0 mg	Semaglutide: once weekly; Liraglutide: once daily	Compare the cost and clinical outcomes of semaglutide vs. liraglutide on weight loss in people with overweight and obesity	N/A[§]
Jamal et al[61]	Kuwait	Retrospective cohort study	115	80.9%	38.8±10.4	Adult/obesity undergone bariatric surgery	Semaglutide or tirzepatide	6.0	Subcutaneous	Semaglutide: 0.25 mg; Tirzepatide: 2.5 mg	Weekly, increasing dose regimen	Effect on anthropometric parameters (TBW, and weight loss proportion %)	High
Abdelmannan et al[62]	UAE	Retrospective cohort study	338	58.0%	57.0±9.3	Adult/T2DM	Exenatide, liraglutide, and dulaglutide	12.0	Subcutaneous	Exenatide: 2 mg; Liraglutide: 1.8 mg, Dulaglutide: 1.5 mg	Exenatide: once weekly; Liraglutide: once daily; Dulaglutide: once weekly	Effect on anthropometric parameters (TBW); effect on cardiometabolic indices (HbA1c)	Moderate
Al Ghareeb et al[74]	Saudi Arabia	Case report	1	100.0%	38	Adult/obesity	Liraglutide	3.0	Subcutaneous	0.6-3 mg	Once daily	Effect on anthropometric parameters (TBW, BMI, and weight loss proportion %)	High
Zakaria et al[63]	UAE	Retrospective cohort study	115	60.0%	43.1±9.9	Adult/obesity, prediabetes	Semaglutide, liraglutide, and tirzepatide,	6.0	Subcutaneous	Semaglutide: 0.25-1.0 mg; Liraglutide: 6.0 mg; Tirzepatide: 2.5-7.0 or 10.0 mg	Semaglutide: once weekly; Liraglutide: once daily; Tirzepatide: once weekly	Effect on anthropometric parameters (TBW, BMI, weight loss proportion %, fat mass, and skeletal muscle mass)	High
Iqbal et al[64]	Kuwait	Case report	1	100.0%	21	Adult/obesity	Tirzepatide	0.75	Subcutaneous	5.0 mg	Once weekly	Possible association with developing ketoacidosis in non-diabetic adults	High
Randomized controlled trials (n=6)													
Al-Kuraishy et al[65]	Iraq	Randomized controlled trial	99	0.0%	41.5±2.9	Adult/obesity	Orlistat	3.0	Oral	120 mg	Once daily	Effect on anthropometric parameters (BMI, visceral adiposity index); effect on cardiometabolic indices (lipid panel, BP, blood glucose)	High

Table 1 - Characteristics of the studies included in this scoping review (continuation).

Authors	Countries	Study designs	Sample sizes	Female (%)	Age (yrs)	Population/ diagnosis	Anti-obesity medication (intervention)	Duration of intervention (months)	Route of AOM administration	Dosage of AOM	Frequency of AOM	Primary outcome(s)	Risk of bias (RoB)
Randomized controlled trials (n=6)													
Aziz et al[75]	Iraq	Pilot of randomized controlled trial	50	76.5%	44.9±8.7	Adult/ metabolic syndrome	Metformin	3.0	Oral	500 mg	3 times daily	Effect on anthropometric parameters (BMI, WC, VAI); effect on cardiometabolic indices (glycemic status, HbA1c, insulin resistance, lipid profile, LFT, kidney function)	High
Esmail et al[66]	Iraq	Randomized controlled trial	50	70.0%	43.2±9.1	Adult/ NAFLD	Orlistat	3.0	Oral	120 mg	Once daily	Effect on anthropometric parameters (BMI, waist circumference, waist to height ratio, ABSI, ABF)	High
Aljamal et al[76]	Jordan	Randomized controlled trial	60	0.0%	-	Adult/ Obesity	Orlistat	1.0	Oral	120 mg	Once daily	Effect on cardiometabolic indices (lipid panel, BP, blood glucose)	High
Aiad et al[77]	Egypt	Randomized controlled trial	60	88.0%	51.6±5.9	Adult/ obesity, osteoarthritis	Metformin	3.0	Oral	500 mg	Twice daily	Effect on serum levels of cartilage biomarkers (COMP, CTX-1, and IL-1β); effect on WOMAC score (pain, stiffness, functionality)	Low
Hany et al[67]	Egypt	Randomized controlled trial	80	71.0%	37.7±10.9	Adult/obesity undergone bariatric surgery	Liraglutide	6.0	Subcutaneous	0.6-3.0 mg	Once daily	Effect on anthropometric parameters (TBW, BMI, and weight loss proportion %)	

*Reported as the mean with no standard deviation. †These values are estimated on the basis of the data provided in the source studies, as the specific statistic was not explicitly reported. ‡RoB assessment not applicable; studies available only as abstracts. §Standard RoB assessment not applicable to this economic analysis - indicates unavailable data. ABSI: a body shape index, BMI: body mass index, BP: blood pressure, CAP: controlled attenuation parameter, COMP: cartilage oligomeric matrix protein, COVID-19: coronavirus disease 2019, CTX-1: C-terminal telopeptide of type I collagen, GLP-1: glucagon-like peptide-1, HbA1c: hemoglobin A1c, IL-1β: interleukin-1 beta, LDL-C: low-density lipoprotein cholesterol, LFT: liver function test, MASLD: metabolic dysfunction - associated steatotic liver disease, NAFLD: nonalcoholic fatty liver disease, PHC: primary healthcare center, RoB: risk of bias, TBW: total body weight, UAE: United Arab Emirates, VAI: visceral adiposity index, WC: waist circumference, WHR: waist-to-hip ratio, WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index, WRPs: weight-reduction products

marked increase in publications between 2020-2024 may reflect a surge in clinical and research interest in AOMs across Arab countries. This could be attributed to the global momentum following recent regulatory approvals of newer agents, such as semaglutide and tirzepatide, growing public awareness, and increased availability of these therapies in the region.

Most of the studies included in this scoping review were carried out in Saudi Arabia, followed by the UAE. Similar to global findings, the majority of the participants in the studies in this review were females with obesity, and most did not have diabetes.[13,83] This female predominance reflects the higher prevalence of obesity observed in women globally.[84]

A total of 43 (72.9%) studies investigated GLP-1 receptor agonists, primarily administered subcutaneously. Liraglutide was most common, followed by semaglutide, dulaglutide, and exenatide. By comparison, oral AOMs have been studied less frequently. This aligns with global reviews emphasizing GLP-1 receptor agonists as a frequent research focus.[85]

Studies included in this review also evaluated several non-GLP-1 receptor agonists, including orlistat (8 studies), lorcaserin, phentermine, metformin, and naltrexone/ bupropion aligning with their reported use in literature from Arab countries.[83,86] This difference can be attributed to several factors, such as the non-availability of many non-GLP-1 receptor analogs, limited access to AOMs in public hospitals, limited knowledge among healthcare providers, and a limited number of obesity specialists.[87] Although this review revealed orlistat to be the most frequently studied non-GLP-1 AOM, global guidelines generally discourage its use as a first-line therapy due to its GI side effects.[88] Similar to global studies, only a few studies in this review investigated the combination of GLP-1 and non-GLP-1 receptor agonists.[83,86,87]

This scoping review identified weight loss proportion, change in TBW and BMI, and WC as the primary outcomes for evaluating weight loss across the included studies. In contrast, TBW was the most frequently reported outcome in studies investigating GLP-1 receptor agonists (approximately half), studies focusing on non-GLP-1 receptor agonists more often utilized BMI. Using different ways to measure outcomes makes it difficult to compare treatments and may hide true differences in how well they work.

Approximately one-third (35.6%) of studies, mostly those evaluating GLP-1 receptor agonists, incorporated multiple anthropometric measures, with fewer reporting visceral fat indices (namely, visceral adiposity index). These findings are consistent with systematic reviews highlighting TBW as a frequent measure of obesity, whereas others emphasize BMI and WC as primary efficacy measures for both AOM classes.[15,89,90] Improvement across various anthropometric parameters is a recognized surrogate for reduced obesity-related morbidity and mortality.[83]

Table 2 - Summary of included studies overall and by type of anti-obesity medications evaluated (N=59).

Variables	Overall	Receptor agonists				
		GLP-1	Dual GIP/ GLP-1	Non-GLP-1	GLP-1 and non-GLP-1	Not reported
Studies	59 (100.0)	39 (66.1)	5 (8.5)	12 (20.3)	2 (3.4)	1 (1.7)
Year of publication						
2014-2019	13 (22.0)	11 (28.2)	0 (0.0)	2 (16.7)	0 (0.0)	0 (0.0)
2020-2024	46 (78.0)	28 (71.8)	5 (100.0)	10 (83.3)	2 (100.0)	1 (100.0)
Study design						
Cohort studies	37 (62.7)	29 (74.4)	3 (60.0)	5 (41.7)	0 (0.0)	0 (0.0)
Case report/series	7 (11.9)	5 (12.8)	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cross-sectional studies	5 (8.5)	1 (2.6)	0 (0.0)	1 (8.3)	2 (100.0)	1 (100.0)
Randomized controlled trial	6 (10.2)	1 (2.6)	0 (0.0)	5 (41.7)	0 (0.0)	0 (0.0)
Non-randomized controlled trial	3 (5.0)	2 (5.1)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Cost-effectiveness analysis	1 (1.7)	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Control arm	11 (18.6)	2 (5.1)	0 (0.0)	9 (75.0)	0 (0.0)	0 (0.0)
Country						
Saudi Arabia	23 (39.0)	19 (48.7)	0 (0.0)	2 (16.7)	1 (50.0)	1 (100.0)
UAE	12 (20.3)	8 (20.5)	3 (60.0)	1 (8.3)	0 (0.0)	0 (0.0)
Egypt	7 (11.9)	4 (10.3)	0 (0.0)	2 (16.7)	1 (50.0)	0 (0.0)
Kuwait	6 (10.2)	4 (10.3)	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)
Iraq	6 (10.2)	2 (5.1)	0 (0.0)	4 (33.3)	0 (0.0)	0 (0.0)
Qatar	2 (3.4)	1 (2.6)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Jordan	1 (1.7)	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Lebanon	1 (1.7)	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Saudi Arabia, Jordan	1 (1.7)	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Funded studies	13 (22.0)	9 (23.1)	1 (20.0)	2 (16.7)	1 (50.0)	0 (0.0)
Risk of bias						
High	21 (35.6)	10 (25.6)	4 (80.0)	4 (33.3)	2 (100)	1 (100)
Moderate	22 (37.3)	16 (41.0)	1 (20.0)	5 (41.7)	0 (0.0)	0 (0.0)
Low	3 (5.1)	2 (5.1)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Not applicable*	13 (22.0)	11 (28.2)	0 (0.0)	2 (16.7)	0 (0.0)	0 (0.0)
Sample size†						
Median (IQR)	91 (50-180)	80 (38-180)	115 (1-115)	100 (60-145)	279 (96-462)	316§
Range	1-3,686	1-2,092	1-3,686	50-404	96-462	
Age, years‖						
Median (IQR)	43.0 (37.7-48.0)	42.5 (37.4-48.7)	38.8 (20.5-48.6)	44.9 (42.2-49.0)	Not mentioned	28§
Range	20.0-60.4	29.0-60.4	20.0-54.1	40.0-53.0	Not mentioned	
Female (%)¶						
Median (IQR)	71.0 (55.2-81.0)	71.2 (56.6-77.7)	80.9 (60.0-100.0)	63.6 (34.1-78.8)	99.2 (98.4-100.0)	38.5§
Range	0.0-100.0	0.0-100.0	59.2-100.0	0.0-88.0	98.4-100.0	
Population/diagnosis						
Obesity	29 (49.2)	18 (46.2)	2 (40.0)	7 (58.3)	2 (100.0)	0 (0.0)
Type 2 diabetes	9 (15.3)	8 (20.5)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Obesity undergone bariatric surgery	7 (11.9)	6 (15.4)	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)
Type 2 diabetes and obesity	7 (11.9)	5 (12.8)	1 (20.0)	1 (8.3)	0 (0.0)	0 (0.0)
Type 2 diabetes and dyslipidemia	1 (1.7)	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Type 2 diabetes, obesity, and MASLD	1 (1.7)	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
NAFLD	1 (1.7)	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Metabolic syndrome	1 (1.7)	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Obesity and osteoarthritis	1 (1.7)	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Obesity and prediabetes	1 (1.7)	0 (0.0)	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)
Primary healthcare visitors	1 (1.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Type of anti-obesity medications#						
Liraglutide	32 (54.2)	29 (74.4)	1 (20.0)	-	2 (100.0)	-
Semaglutide	12 (20.3)	9 (23.1)	2 (40.0)	-	1 (50.0)	-
Dulaglutide	4 (6.8)	4 (10.3)	-	-	-	-
Exenatide	2 (3.4)	2 (5.1)	-	-	-	-
Tirzepatide	5 (8.5)	-	5 (100.0)	-	-	-
Orlistat	8 (13.6)	-	-	6 (50.0)	2 (100.0)	-
Metformin	5 (8.5)	-	-	4 (33.3)	1 (50.0)	-
Lorcaserin and phentermine	1 (1.7)	-	-	1 (8.3)	-	-
Naltrexone/Bupropion	1 (1.7)	-	-	1 (8.3)	-	-
Non-prescribed WRPs	1 (1.7)	-	-	1 (8.3)	-	-
Not reported	1 (1.7)	-	-	-	-	1 (100.0)
Route						
Subcutaneous	40 (67.8)	35 (89.7)	5 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Oral	12 (20.3)	1 (2.6)	0 (0.0)	11 (91.7)	0 (0.0)	0 (0.0)
Subcutaneous and oral	2 (3.4)	1 (2.6)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)
Not reported	5 (8.5)	2 (5.1)	0 (0.0)	1 (8.3)	1 (50.0)	1 (100.0)

Table 2 - Summary of included studies overall and by type of anti-obesity medications evaluated (N=59, continuation).

Variables	Overall	Receptor agonists				
		GLP-1	Dual GIP/GLP-1	Non-GLP-1	GLP-1 and non-GLP-1	Not reported
Primary outcome category						
Anthropometric outcomes	28 (47.5)	20 (51.3)	2 (40.0)	5 (41.7)	1 (50.0)	0 (0.0)
Anthropometric and cardiometabolic outcomes	14 (23.7)	11 (28.2)	0 (0.0)	3 (25.0)	0 (0.0)	0 (0.0)
Safety and tolerability	4 (6.8)	2 (5.1)	2 (40.0)	0 (0.0)	0 (0.0)	0 (0.0)
PROs	3 (5.1)	1 (2.6)	0 (0.0)	1 (8.3)	0 (0.0)	1 (100.0)
Biomarkers and biochemical effects	3 (5.1)	2 (5.1)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Cardiometabolic outcomes	3 (5.1)	1 (2.6)	1 (20.0)	1 (8.3)	0 (0.0)	0 (0.0)
Health behaviors/practices	2 (3.4)	1 (2.6)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)
Biomarkers/biochemical effects and PROs	1 (1.7)	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Health economics	1 (1.7)	1 (2.6)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Primary outcome (anthropometric)						
TBW	27 (45.8)	22 (56.4)	2 (40.0)	3 (25.0)	0 (0.0)	0 (0.0)
BMI	23 (39.0)	14 (35.9)	1 (20.0)	7 (58.3)	1 (50.0)	0 (0.0)
Weight loss proportion (%)	17 (28.8)	13 (33.3)	2 (40.0)	2 (16.7)	0 (0.0)	0 (0.0)
Waist circumference	4 (6.8)	2 (5.1)	0 (0.0)	2 (16.7)	0 (0.0)	0 (0.0)
More than one anthropometric measurement[†]	21 (35.6)	15 (38.5)	2 (40.0)	4 (33.3)	0 (0.0)	0 (0.0)
Primary outcome (cardiometabolic)						
HbA1c	12 (20.3)	10 (25.6)	1 (20.0)	1 (8.3)	0 (0.0)	0 (0.0)
Lipid profile	6 (10.2)	2 (5.1)	0 (0.0)	4 (33.3)	0 (0.0)	0 (0.0)
Secondary outcome						
Cardiometabolic outcomes	17 (28.8)	14 (35.9)	1 (20.0)	2 (16.7)	0 (0.0)	0 (0.0)
Anthropometric and cardiometabolic outcomes	4 (6.8)	4 (10.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Anthropometric outcomes	3 (5.1)	1 (2.6)	1 (20.0)	1 (8.3)	0 (0.0)	0 (0.0)
Safety and tolerability	2 (3.4)	1 (2.6)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)
Inflammatory and oxidative stress markers	3 (5.1)	1 (2.6)	0 (0.0)	2 (16.7)	0 (0.0)	0 (0.0)
Not reported	30 (50.8)	18 (46.2)	3 (60.0)	7 (58.3)	1 (50.0)	1 (100.0)
Side effect						
GI side effect with additional symptoms	9 (15.3)	4 (10.3)	2 (40.0)	1 (8.3)	2 (100.0)	0 (0.0)
GI side effects only	6 (10.2)	3 (7.7)	0 (0.0)	3 (25.0)	0 (0.0)	0 (0.0)
GI side effects with serious complications	4 (6.8)	4 (10.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Non-GI side effects	2 (3.4)	1 (2.6)	0 (0.0)	1 (8.3)	0 (0.0)	0 (0.0)
Not reported	38 (64.4)	27 (69.2)	3 (60.0)	7 (58.3)	0 (0.0)	1 (100.0)

[*]Risk of bias assessment not applicable; studies available only as abstracts or as an economic analysis study. [†]Sample size reported for 57 studies (2 studies did not report sample size). [‡]IQR and range values are not reported because they are derived from a single study only. [§]Age reported for 49 studies (10 studies did not report age). [¶]Gender proportion reported for 52 studies (7 studies did not report the gender proportion). [#]Some studies are counted more than once because they include multiple types of anti-obesity medication. [**]Number of studies reported at least 2 anthropometric measurements (TBW, BMI, WC, or weight loss proportion %).

BMI: body mass index, Dual GIP: dual glucose-dependent insulinotropic polypeptide, GLP-1: glucagon-like peptide-1, GI: gastrointestinal, HbA1c: hemoglobin A1c, IQR: interquartile range, MASLD: metabolic dysfunction - associated steatotic liver disease, NAFLD: nonalcoholic fatty liver disease, TBW: total body weight, WC: waist circumference, WRP: weight-reduction product

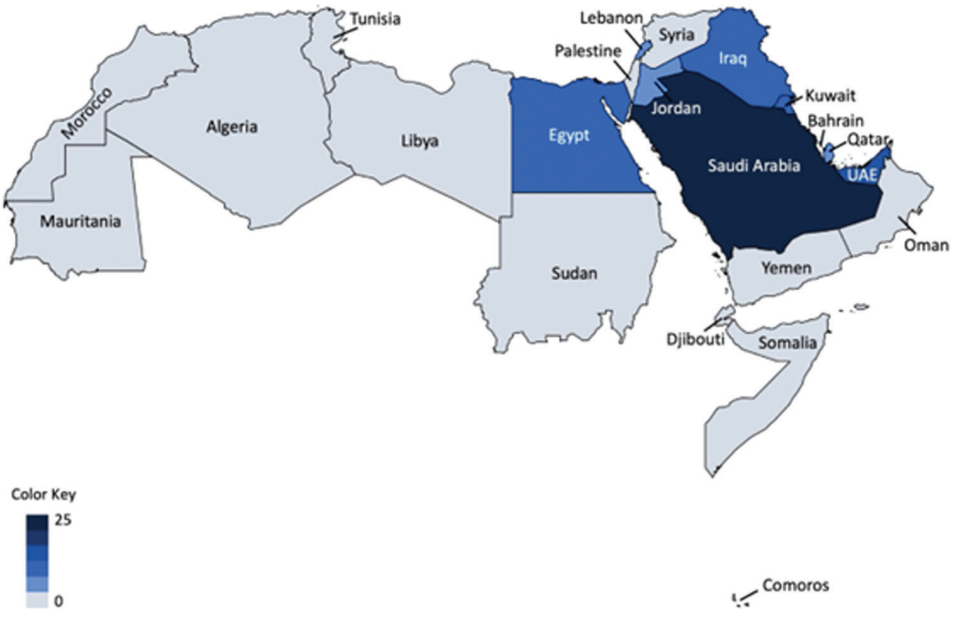

Figure 3 - Geographic heatmap of included anti-obesity medication study count in the Arab world (N=59).

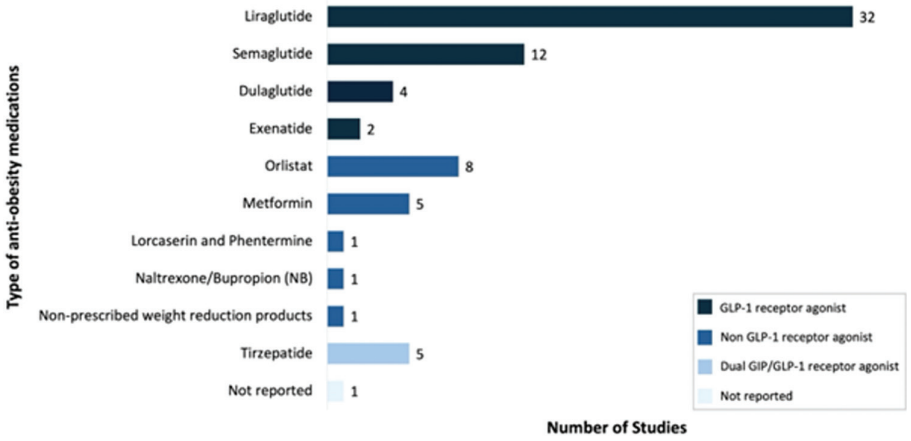

Figure 4 - Number of included studies by type of anti-obesity medications (N=59). Some studies were counted more than once because they included multiple types of anti-obesity medication. GIP: glucose-dependent insulinotropic polypeptide, GLP-1: glucagon-like peptide-1

Cardiometabolic indices such as lipid profiles, HbA1c, and blood pressure are established surrogates for assessing obesity-related mortality risk.[91] A significant portion of studies, primarily those investigating GLP-1 receptor agonists, reported cardiometabolic measures, most commonly HbA1c reduction. This aligns with global AOM reviews.[92]

Liraglutide was the most frequently prescribed AOM in this review, which is consistent with its high efficacy and frequent use in obesity clinics.[89] Semaglutide was the next most common GLP-1 receptor agonist, which is also supported by other reviews.[89] Notably, recent US data indicate a substantial increase in semaglutide prescriptions.[93] Additionally, tirzepatide, a dual GIP/GLP-1 receptor agonist, has gained prominence following USFDA approval in 2023 for weight management in adults with obesity or overweight and has demonstrated robust efficacy in RCTs.[93-95]

However, this review identified only 5 tirzepatide studies, primarily cohort studies from the UAE and Kuwait published in 2024, which contrasts with international research in which tirzepatide has been investigated in multiple RCTs.[85]

There are several new medications in phase 2 trials, including dual and triple hormone receptor agonists, which have shown promising early results for treating obesity. One example is retatrutide, a triple agonist targeting GLP-1, GIP, and glucagon receptors, which demonstrated statistically significant weight loss (22.8-24.2%) and metabolic improvements in systolic and diastolic blood pressure and levels of glycated hemoglobin, fasting glucose, insulin, and lipids in a 48-week phase 2 trial, highlighting its potential for future obesity management.[96]

Researchers have compared the safety and tolerability of GLP-1 and non-GLP-1 receptor agonists. While serious GI side effects are more common with GLP-1 receptor agonists, the overall incidence of serious side effects is similar between groups.[81,84] However, this review identified a significant gap in the reporting of such side effects. Only 15.3% of included studies reported whether patients experienced GI side effects with additional symptoms, and 6.8% serious GI complications like pancreatitis and severe nausea and vomiting (exclusively in studies of GLP-1 receptor agonists).

The study offered a comprehensive evaluation of scientific literature surrounding AOMs in Arab populations, highlighting several key elements. The study emphasizes the importance of addressing obesity as a public health priority. The distinct genetic susceptibilities among Arab populations may necessitate tailored pharmacotherapy approaches. The predominance of observational studies indicates a significant gap in high-quality RCTs. This suggests a need for more rigorous research to validate the efficacy and safety of AOMs in this demographic. The emphasis on older AOMs such as liraglutide suggests that newer options like semaglutide and tirzepatide are under-researched. A network meta-analysis comparing various GLP-1 receptor agonists (23 RCTs, N=11,545) demonstrated the superior efficacy of newer agents like semaglutide (2.4 mg) for weight loss compared to older options such as liraglutide (3.0 mg), although all GLP-1 RAs outperformed placebo.[97] Therefore, investigating these newer medications in Arab countries could lead to improved treatment outcomes. The barriers to carrying out high-quality research, such as limited funding and

resources, point to a broader issue within Arab healthcare systems. Addressing these challenges could promote better obesity management strategies. In summary, this study highlights the need for more targeted research on AOMs in Arab populations, emphasizes the importance of understanding genetic and environmental factors, and calls for improved healthcare resources to address the obesity epidemic effectively.

Study's strengths & limitations. This study revealed significant gaps in the literature and unmet needs in obesity management for the Arab population.

We acknowledge several limitations. Most evidence comes from non-Arabic literature, with limited data from the Middle East. Additionally, studies from non-Arab sources may differ in their methodologies, populations, or inclusion criteria, which may limit comparability and generalizability to the Arab context. The studies we reviewed were mainly observational with moderate to high RoB, indicating the need for well-designed, larger, randomized trials to determine their efficacy and safety. Notably, there is a lack of rigorous high-quality studies on novel AOMs, such as semaglutide and tirzepatide, in the region. Additionally, our focus on studies initiated within Arab countries may limit comparative insights from broader, internationally initiated research.

In conclusion, the current scoping review emphasizes the need for targeted, high-quality research to inform evidence-based strategies for obesity management in Arab countries. Notably, there is a lack of sufficient studies in this region, with existing research often being limited in number, of low quality, and inconsistent in reporting key outcomes. Future research should focus on improving study quality, standardizing methodologies, the adoption of a standard outcome measure, and expanding representation to improve our understanding of the efficacy and safety of AOMs in this region. By addressing these areas, future research can significantly improve obesity management and inform policy development tailored to the unique genetic and socio-cultural context of Arab societies.

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Appendix 1 - Literature search of anti-obesity medications in Arab countries - SR (Embase 1974-2024 October 04, Ovid MEDLINE(R) ALL 1946-October 04, 2024).

#	Searches	Results
1	exp Overweight/ use medall	287944
2	exp Obesity/ use oemezd	717918
3	(over-weight or overweight or obese* or obesitas or obesity*).tw,kf,kw.	1088852
4	or/1-3 [Overweight/Obese Concept]	1348474
5	exp Anti-Obesity Agents/ use medall	21227
6	exp Antiobesity Agent/ use oemezd	38943
7	((anti-obesity or antiobesity or anti-obese or antiobese or weight-loss or weightloss or ((body-weight or bodyweight or weight) adj2 (lose? or losing or reduc*))) adj2 (agent? or drug? or medication? or pharmaceutical? or pharmacotherap* or pharma-cotherap* or pharmaco-therap*)).tw,kf,kw. or (aclimostat or ZGN-1061 or ZGN1061).mp. or (beloranib or cdk-732 or cdk732 or zgn-433 or zgn433).mp. or (benfluorex or benfluramate or "SE 780" or "780 SE" or "JP 992" or "S 780").mp. or (benzphetamine or benzfetamine or benzylamphetamine or benzylmetamphetamine or dextro-benzphetamine or didrex or inapetyl or "l benzphetamine" or "levo benzphetamine" or "n benzyl n methyl 1 phenyl 2 propanamine" or "n benzyl n methylamphetamine" or "n benzyl n,alpha dimethylphenethylamine" or "n benzylmethamphetamine").mp. or (bio101 or bio-101 or myoda or sarconeos).mp. or ("bupropion hydrochloride, naltrexone hydrochoride drug combination" or (bupropion hydrochloride adj natrexone hydrochloride) or Mysimba or Contrave).mp. or (butenolide or 2-furanone or crotonolactone or 2-B4O or 2-buten-4-olide).mp. or (cagrilintide or am-833 or am833 or nn-9838 or nn9838 or "Nnc-0174 0833" or nnc01740833).mp. or (cetilistat or ATL-962).mp. or ("CGP 71683 A" or CGP71683A or CGP-71683A).mp. or (danuglipron or "pf 06882961" or "pf 06882961 82" or pf06882961 or pf0688296182). mp. or (Diethylpropion or Amfepramon or Amfepramone or Phepranon or 2-Diethylaminopropiophenone or Anorex or Lipomin or Regenon or Dietil-retard or Dietilretard or Regibon or Tenuate or Delgamer or Maruate or Moderatan or Neobes or Nobesine or Propion or Prefamone or Tepanil or "Ifa Norex").mp. or (efinopegdutide or "hm 12525a" or hm12525a or "jnj 5111" or "jnj 64565111" or jnj5111 or jnj64565111). mp. or ("FG 7142" or "ZK 39106" or "N-methyl-beta-carboline-3-carboxamide").mp. or gambi-jung.mp. or hm04.mp. or (Islet Amyloid Polypeptide or Pancreatic Amylin or IAPP Protein or Insulinoma Amyloid Polypeptide or Amlintide or Amylin or IAPP Precursor).mp. or (lipid mobili#ing substance? or fat mobili#ing substance? or lipid mobili#ing factor?).mp. or (livoletide or "azp 531" or azp531 or cyclo).mp. or (norpseudoephedrine or pseudonorephedrine or cathine or exponcit or fasupond or Fugoa Depo).mp. or (oleoyl-estrone or Merlin-2).mp. or (Orlistat or Tetrahydrolipstatin or THLP or Tetrahydrolipastatin or Ro-18-0647 or Xenical).mp. or (perflubron or perfluorooctylbromide or perfluorooctyl bromide or PFOB or perfluorooctylbromide or Imagent GI or L-1913 or LA-11063 or LA11063 or perflubron emulsion or AF0144 or perfluorooctyl iodide or perfluorooctyliodide or Imagent BP or Oxygent).mp. or (Phenmetrazine or Oxazimedrine or Fenmetrazin or Defenmetrazin or Phenmetraline or Preludin).mp. or exp Phentermine/ or (Phentermine or Duromine or Adipex-P or AdipexP or Ionamine or Chlorphentermine or Pre-Sate or Desopimon or Avipron or Mephentermine).mp. or phentermine-topiramate.mp. or exp Phenylpropanolamine/ or (Phenylpropanolamine or Norephedrine or Propagest or Prolamine or Triaminic DM or Dexatrim or Metaraminol or meta-Hydroxynorephedrine or Metaradrin or m-Hydroxyphenylpropanolamine or m-Hydroxynorephedrine or Hydroxyphenylpropanolamine or Isophenylephrine or Aramine or Araminol or p-Hydroxynorephedrine or para-Hydroxynorephedrine or Tolterodine Tartrate or Tolterodine or Detrol or Urotrol or PHA-686464B or PHA686464B or Detrusitol or Unidet).mp. or (pyroglutamyl-histidyl-glycine or pGlu-His-Gly-OH or Pyr-His-Gly or colon mitosis inhibitor or pyroGlu-His-GlyOH or pGlu-His-Gly or pyro-Glu-His-Gly-OH or Ro 14-61332 or anorexigenic peptide).mp. or (Rimonabant or SR141716 or SR 141716 or Zimulti or SR-141716A or SR141716A or Acomplia).mp. or Satietin.mp. or (setmelanotide or "bim 22493" or bim22493 or "cam 4072" or cam4072 or imcivree or "irc 022493" or irc022493 or "rm 493" or rm493).mp. or (sibutramine or di-desmethylsibutramine or didesmethylsibutramine or "(R)-DDMS" or Reductil or mono-desmethylsibutramine or sibutramine hydrochloride or "BTS 54 524" or BTS-54524 or Meridia).mp. or (sucunamostat or "sco 792" or sco792 or "tak 792" or tak792).mp. or Topiramate.mp. or (vutiglabridin or "hsg 4112" or hsg4112).mp.	144736
8	Glucagon-Like Peptide-1 Receptor/ag use medall	2636
9	exp Glucagon like peptide 1 receptor agonist/ use oemezd	55997
10	(((GLP-1 or GLP1 or GLP-1R or GLP1R or glucagon-like peptide-1) adj2 (agonist? or stimulating agent?)) or (("long acting GLP 1" or "long acting glucagon like peptide 1" or "longacting glucagon like peptide 1") adj2 agonist?) or albenatide or (albiglutide or albugon or "albumin GLP 1" or "albumin glucagon like peptide 1" or eperzan or "GLP 1 albumin" or "glucagon like peptide 1 albumin" or "gsk 716155" or "gsk 716155a" or gsk-716155 or gsk716155 or Gsk-716155a or gsk716155a or naliglutide or syncria or tanzeum) or beinaglutide or ("cjc 1131" or cjc1131) or (cotadutide or "medi 0382" or medi0382) or (danuglipron or "pf 06882961" or "pf 06882961 82" or pf06882961 or pf0688296182) or (dulaglutide or "ly 05008" or "ly 2189265" or ly05008 or ly2189265 or trulicity) or (ecnoglutide or "xw 004" or xw004) or (efocipegtrutide or "hm 15211" or hm15211) or (efpeglenatide or "hm 11260c" or hm11260c or "LAPS exendin 4" or "sar 439977" or sar439977) or elsiglutide or (exenatide or "ac 002993" or ac002993 or AC-2993 or ac2993 or "ac 2993a" or ac2993a or Bydureon or Byetta or "da 3091" or da3091 or "dlp 414" or dlp414 or "exendin 4" or "Ex4 Peptide" or exenasphere or "ft 228" or ft228 or "itca 650" or itca650 or "ly 2148568" or ly2148568 or "ormd 0901" or ormd0901 or "pt 302" or pt302) or ("insulin degludec plus liraglutide" or ideglira or "insulin degludec/liraglutide" or "liraglutide plus insulin degludec" or "liraglutide/insulin degludec" or "nn 9068" or nn9068 or xultophy or "xultophy 100/3.6") or ("insulin glargine plus lixisenatide" or "ave 0010 / hoe 901" or "ave0010/hoe901" or "hoe 901 / ave 0010" or "hoe901/ave0010" or iglarlixi or "insulin glargine/ lixisenatide" or "lantus/lyxumia" or lixilan or "lixilan l" or "lixilan o" or "lixisenatide plus insulin glargine" or "lixisenatide/insulin glargine" or "lyxumia/lantus" or soliqua or suliqua) or (liraglutide or "4p 004" or 4p004 or "nn 2211" or nn2211 or "nnc 90 1170" or "nnc 90-1170" or "nnc90 1170" or nnc90-1170 or "rd 12014" or rd12014 or Saxenda or Victoza) or (lixisenatide or adlyxin or "aqve 10010" or aqve10010 or "ave 0010" or "ave0010 des 38 proline exendine 4 [1-39]peptidylpentalysyllysinamide" or lyxumia or "zp 10" or zp10) or ("ly 307161" or ly307161) or "lys 40 (nodaga ga 68)nh2 exendin 4" or (mazdutide or "ibi 362" or ibi362 or "ly 3305677" or ly3305677 or "oxm 3" or oxm3) or (pegapamodutide or "ly 2944876" or ly2944876 or "tt 401" or tt401) or (pegloxenatide or "pex 168" or pex168) or (pemvidutide or "alt 801" or alt801 or "sp 1373" or sp1373 or "vpd 107" or vpd107) or (retatrutide or "ly 3437943" or ly3437943) or (semaglutide or Ozempic or Rybelsus or Wegovy or "nn 9535" or nn9535 or "nn 9924" or nn9924 or "nnc 0113 0217" or nnc01130217 or "og 217 sc" or "og 217sc" or og217sc) or (taspoglutide or "bim 51077" or bim51077 or "itm 077" or itm077 or "r 1583" or r1583 or "ro 5073031" or ro5073031) or (tirzepatide or LY3298176 or "ly 3298176" or mounjaro) or utreglutide or (vurolenatide or glp1-xten or "nb 1001" or nb1001 or "nm 002" or nm002 or xten-glp1)).mp. or Carnitine/ or (levocarnitine or "Vitamin BT" or L-Carnitine or Bicarnesine).mp. or Naltrexone-bupropion.mp.	90519
11	or/5-10 [Anti-Obesity Medication Concept]	261410
12	4 and 11 [Obesity/Overweight + Anti-Obesity Medication]	51375
13	exp *Overweight/dt use medall	7543
14	exp *Obesity/dt use oemezd	17134
15	or/12-14 [ALL Obesity/Overweight + Anti-Obesity Medication]	64488

Appendix 1 - Literature search of anti-obesity medications in Arab countries - SR (Embase 1974-2024 October 04, Ovid MEDLINE(R) ALL 1946-October 04, 2024). (Continuation)

#	Searches	Results
16	(Algeria/ or Bahrain/ or Comoros/ or Djibouti/ or Egypt/ or Iraq/ or Jordan/ or Kuwait/ or Lebanon/ or Libya/ or Libyan Arab Jamahiriya/ or Mauritania/ or Morocco/ or Oman/ or Palestine/ or Qatar/ or Saudi Arabia/ or Somalia/ or South Sudan/ or Sudan/ or Syrian Arab Republic/ or Tunisia/ or exp United Arab Emirates/ or Yemen/ or Arabs/ or Arab World/ or Africa, Eastern/ or East African People/ or East African/ or Middle East/ or Middle Eastern People/ or "Middle Eastern and North Africans"/ or Africa, Northern/ or North African People/ or North Africa/ or North African/) use medall	113023
17	(exp Algeria/ or exp Bahrain/ or exp Comoros/ or exp Djibouti/ or exp Egypt/ or exp Iraq/ or exp Jordan/ or exp Kuwait/ or exp Lebanon/ or exp Libya/ or exp Mauritania/ or exp Morocco/ or exp Oman/ or exp Palestine/ or exp Qatar/ or exp Saudi Arabia/ or exp Somalia/ or exp South Sudan/ or exp Sudan/ or exp Syrian Arab Republic/ or exp Tunisia/ or exp United Arab Emirates/ or exp Yemen/ or exp Arab/ or exp North Africa/ or Middle East/) use oemezd	169832
18	(Algeria or Algerian? or Bahrain or Manama or Bahraini? or Comoros or Comores or Mayotte or Moroni or Comorian? or Shikomor? or Djibouti or Somaliland or Djiboutian? or Djiboutien? or Egypt or Cairo or "United Arab Republic" or Egyptian? or Iraq or Baghdad or Iraqi? or Jordan or Amman or Transjordan or Jordanian? or Kuwait or Kuweit or Kuwaiti? or Lebanon or Leban* or Liban* or Lubnan* or Lobnan* or Lebanese or Libya or Libia or Libyan? or Tripoli or Mauritania* or Nouakchott or Morrocco or Morocco or Ifni or Rabat or Moroccan? or Oman or Muscat or Omani? or Palestine or Gaza or Ghaza or Ghazza or West Bank or Palestinian? or Qatar or Doha or Katar or Quatar or Qatari? or Saudi? or KSA or Riyadh or Somali? or Mogadishu or South Sudan or Juba or South Sudanese or Sudan or Khartoum or Sudanese or Syria or Damascus or Syrian? or Tunisia or Tunesia or Tunis or Tunisian? or United Arab Emirates or UAE or Abu dhabi or Ajman or Dubai or Sharjah or Trucial state? or Emirati? or Yemen or Aden or Sanaa or "Sana'a" or Yemeni? or East Mediterranean or Eastern Mediterranean or EMRO or Levant or Levantine? or (MENA adj2 region?) or Arab? or Arabia or Arabian? or Arabic World or East African? or Eastern Africa or Eastern African? or Middle East or MENA or Middle Eastern? or Maghreb or North Africa? or Northern Africa? or Meghrebis or Meghrebian?).ab,cp,gi,in,ia,jw,jx,kf,kw,lg,ti.	1848329
19	or/16-18 [Arab Countries Concept]	1873790
20	15 and 19 [Obesity/Overweight + Anti-Obesity Medication + Arab Countries Concept]	2545
21	exp Adult/ or (adult or adults or adulthood).tw,kf,kw. or (man or men or woman or women).tw,kf,kw. or middle-age?.tw,kf,kw. or age?.tw,kf,kw. or (elderly or geriatric* or gerontolog* or old-age? or senior?).tw,kf,kw. or (older adj2 (female? or male? or patient? or person? or people? or population?)).tw,kf,kw. [Adults]	26304509
22	20 and 21 [Obesity + Drug Therapy + Arab Countries + Adults]	987
23	(exp Child/ not (exp Adult/ and exp Child/)) or (exp Child/ not (Adolescent/ and exp Child/)) or (exp Infant/ not (exp Adult/ and exp Infant/)) or (exp Infant/ not (Adolescent/ and exp infant/))	4994362
24	20 not 23 [Child-/Infant-Only Removed]	2474
25	22 or 24 [Obesity + Drug Therapy + Arab Countries + ALL Adults]	2515
26	(exp animals/ or exp animal experimentation/ or exp models animal/ or exp animal experiment/ or nonhuman/ or exp vertebrate/) not (exp humans/ or exp human experiment/) [Animal Only]	12818039
27	25 not 26 [Obesity + Drug Therapy + Arab Countries + ALL Adults + Human]	1944
28	(202311* or 202312* or 2024* or 2025*).ed,dt. use medall or (202311* or 202312* or 2024* or 2025*).dc,dd. use oemezd	3661941
29	27 and 28 [Obesity + Drug Therapy + Arab Countries + ALL Adults + Human, 2023 Nov-current]	350
30	remove duplicates from 29 [Final set, duplicates removed]	272 [268 after duplicates removed]

– Literature search
Related SR: 34895470.ui.
Date(s): 2023 Nov 29-2024 Oct 7 (update, as run)
Limits: year range, as above
Databases: Ovid Medline [medall], Embase [oemezd]; The Cochrane Library [cctr]; Index Medicus for the Eastern Mediterranean Region (IMEMR) (https://vlibrary.emro.who.int/searchd/?database=imemr&records=); E-Marefa database (https://search.emarefa.net/en)
Filters: adults OR NOT Child/Infant Only; NOT Animal Only
Search output: RIS (for Covidence)
Syntax definitions: AB: abstract, CP: country of publication, GI: grant information, IN: institution, IA: investigator affiliation, JW: journal word (Medline), JX: journal word (Embase), KF: keyword heading word, KW: keyword heading, TI: title, LG: language

Appendix 2 - Literature search of anti-obesity medications in Arab countries - SR the Cochrane Library (CENTRAL).

#	Searches	Results
1	exp Overweight/	25617
2	(over-weight or overweight or obese* or obesitas or obesity*).tw,kf,kw.	59595
3	or/1-2 [Overweight/Obese Concept]	62817
4	exp Anti-Obesity Agents/	2642
5	((anti-obesity or antiobesity or anti-obese or antiobese or weight-loss or weightloss or ((body-weight or bodyweight or weight) adj2 (lose? or losing or reduc*))) adj2 (agent? or drug? or medication? or pharmaceutical? or pharmacotherap* or pharma-cotherap* or pharmaco-therap*)).tw,kf,kw. or (aclimostat or ZGN-1061 or ZGN1061).mp. or (beloranib or cdk-732 or cdk732 or zgn-433 or zgn433).mp. or (benfluorex or benfluramate or "SE 780" or "780 SE" or "JP 992" or "S 780").mp. or (benzphetamine or benzfetamine or benzylamphetamine or benzylmetamphetamine or dextro-benzphetamine or didrex or inapetyl or "l benzphetamine" or "levo benzphetamine" or "n benzyl n methyl 1 phenyl 2 propanamine" or "n benzyl n methylamphetamine" or "n benzyl n,alpha dimethylphenethylamine" or "n benzylmethamphetamine").mp. or (bio101 or bio-101 or myoda or sarconeos).mp. or ("bupropion hydrochloride, naltrexone hydrochoride drug combination" or (bupropion hydrochloride adj natrexone hydrochloride) or Mysimba or Contrave).mp. or (butenolide or 2-furanone or crotonolactone or 2-B4O or 2-buten-4-olide).mp. or (cagrilintide or am-833 or am833 or nn-9838 or nn9838 or "Nnc-0174 0833" or nnc01740833).mp. or (cetilistat or ATL-962).mp. or ("CGP 71683 A" or CGP71683A or CGP-71683A).mp. or (danuglipron or "pf 06882961" or "pf 06882961 82" or pf06882961 or pf0688296182).mp. or (Diethylpropion or Amfepramon or Amfepramone or Phepranon or 2-Diethylaminopropiophenone or Anorex or Lipomin or Regenon or Dietil-retard or Dietilretard or Regibon or Tenuate or Delgamer or Maruate or Moderatan or Neobes or Nobesine or Propion or Prefamone or Tepanil or "Ifa Norex").mp. or (efinopegdutide or "hm 12525a" or hm12525a or "jnj 5111" or "jnj 64565111" or jnj5111 or jnj64565111).mp. or ("FG 7142" or "ZK 39106" or "N-methyl-beta-carboline-3-carboxamide").mp. or gambi-jung.mp. or hm04.mp. or (Islet Amyloid Polypeptide or Pancreatic Amylin or IAPP Protein or Insulinoma Amyloid Polypeptide or Amlintide or Amylin or IAPP Precursor).mp. or (lipid mobili#ing substance? or fat mobili#ing substance? or lipid mobili#ing factor?).mp. or (livoletide or "azp 531" or azp531 or cyclo).mp. or (norpseudoephedrine or pseudonorephedrine or cathine or exponcit or fasupond or Fugoa Depo).mp. or (oleoyl-estrone or Merlin-2).mp. or (Orlistat or Tetrahydrolipstatin or THLP or Tetrahydrolipastatin or Ro-18-0647 or Xenical).mp. or (perflubron or perfluorooctylbromide or perfluorooctyl bromide or PFOB or perfluorooctylbromide or Imagent GI or L-1913 or LA-11063 or LA11063 or perflubron emulsion or AF0144 or perfluorooctyl iodide or perfluorooctyliodide or Imagent BP or Oxygent).mp. or (Phenmetrazine or Oxazimedrine or Fenmetrazin or Defenmetrazin or Phenmetraline or Preludin).mp. or exp Phentermine/ or (Phentermine or Duromine or Adipex-P or AdipexP or Ionamine or Chlorphentermine or Pre-Sate or Desopimon or Avipron or Mephentermine).mp. or phentermine-topiramate.mp. or exp Phenylpropanolamine/ or (Phenylpropanolamine or Norephedrine or Propagest or Prolamine or Triaminic DM or Dexatrim or Metaraminol or meta-Hydroxynorephedrine or Metaradrin or m-Hydroxyphenylpropanolamine or m-Hydroxynorephedrine or Hydroxyphenylpropanolamine or Isophenylephrine or Aramine or Araminol or p-Hydroxynorephedrine or para-Hydroxynorephedrine or Tolterodine Tartrate or Tolterodine or Detrol or Urotrol or PHA-686464B or PHA686464B or Detrusitol or Unidet).mp. or (pyroglutamyl-histidyl-glycine or pGlu-His-Gly-OH or Pyr-His-Gly or colon mitosis inhibitor or pyroGlu-His-GlyOH or pGlu-His-Gly or pyro-Glu-His-Gly-OH or Ro 14-61332 or anorexigenic peptide).mp. or (Rimonabant or SR141716 or SR 141716 or Zimulti or SR-141716A or SR141716A or Acomplia).mp. or Satietin.mp. or (setmelanotide or "bim 22493" or bim22493 or "cam 4072" or cam4072 or imcivree or "irc 022493" or irc022493 or "rm 493" or rm493).mp. or (sibutramine or di-desmethylsibutramine or didesmethylsibutramine or "(R)-DDMS" or Reductil or mono-desmethylsibutramine or sibutramine hydrochloride or "BTS 54 524" or BTS-54524 or Meridia).mp. or (sucunamostat or "sco 792" or sco792 or "tak 792" or tak792).mp. or Topiramate.mp. or (vutiglabridin or "hsg 4112" or hsg4112).mp.	5942
6	Glucagon-Like Peptide-1 Receptor/ag	31
7	((((GLP-1 or GLP1 or GLP-1R or GLP1R or glucagon-like peptide-1) adj2 (agonist? or stimulating agent?)) or (("long acting GLP 1" or "long acting glucagon like peptide 1" or "longacting glucagon like peptide 1") adj2 agonist?) or albenatide or (albiglutide or albugon or "albumin GLP 1" or "albumin glucagon like peptide 1" or eperzan or "GLP 1 albumin" or "glucagon like peptide 1 albumin" or "gsk 716155" or "gsk 716155a" or gsk-716155 or gsk716155 or Gsk-716155a or gsk716155a or naliglutide or syncria or tanzeum) or beinaglutide or ("cjc 1131" or cjc1131) or (cotadutide or "medi 0382" or medi0382) or (danuglipron or "pf 06882961" or "pf 06882961 82" or pf06882961 or pf0688296182) or (dulaglutide or "ly 05008" or "ly 2189265" or ly05008 or ly2189265 or trulicity) or (ecnoglutide or "xw 004" or xw004) or (efocipegtrutide or "hm 15211" or hm15211) or (efpeglenatide or "hm 11260c" or hm11260c or "LAPS exendin 4" or "sar 439977" or sar439977) or elsiglutide or (exenatide or "ac 002993" or ac002993 or AC-2993 or ac2993 or "ac 2993a" or ac2993a or Bydureon or Byetta or "da 3091" or da3091 or "dlp 414" or dlp414 or "exendin 4" or "Ex4 Peptide" or exenasphere or "ft 228" or ft228 or "itca 650" or itca650 or "ly 2148568" or ly2148568 or "ormd 0901" or ormd0901 or "pt 302" or pt302) or ("insulin degludec plus liraglutide" or ideglira or "insulin degludec/liraglutide" or "liraglutide plus insulin degludec" or "liraglutide/insulin degludec" or "nn 9068" or nn9068 or xultophy or "xultophy 100/3.6") or ("insulin glargine plus lixisenatide" or "ave 0010 / hoe 901" or "ave0010/hoe901" or "hoe 901 / ave 0010" or "hoe901/ave0010" or iglarlixi or "insulin glargine/lixisenatide" or "lantus/lyxumia" or lixilan or "lixilan l" or "lixilan o" or "lixisenatide plus insulin glargine" or "lixisenatide/insulin glargine" or "lyxumia/lantus" or soliqua or suliqua) or (liraglutide or "4p 004" or 4p004 or "nn 2211" or nn2211 or "nnc 90 1170" or "nnc 90-1170" or "nnc90 1170" or nnc90-1170 or "rd 12014" or rd12014 or Saxenda or Victoza) or (lixisenatide or adlyxin or "aqve 10010" or aqve10010 or "ave 0010" or "ave0010 des 38 proline exendine 4 [1-39] peptidylpentalysyllysinamide" or lyxumia or "zp 10" or zp10) or ("ly 307161" or ly307161) or "lys 40 (nodaga ga 68)nh2 exendin 4" or (mazdutide or "ibi 362" or ibi362 or "ly 3305677" or ly3305677 or "oxm 3" or oxm3) or (pegapamodutide or "ly 2944876" or ly2944876 or "tt 401" or tt401) or (pegloxenatide or "pex 168" or pex168) or (pemvidutide or "alt 801" or alt801 or "sp 1373" or sp1373 or "vpd 107" or vpd107) or (retatrutide or "ly 3437943" or ly3437943) or (semaglutide or Ozempic or Rybelsus or Wegovy or "nn 9535" or nn9535 or "nn 9924" or nn9924 or "nnc 0113 0217" or nnc01130217 or "og 217 sc" or "og 217sc" or og217sc) or (taspoglutide or "bim 51077" or bim51077 or "itm 077" or itm077 or "r 1583" or r1583 or "ro 5073031" or ro5073031) or (tirzepatide or LY3298176 or "ly 3298176" or mounjaro) or utreglutide or (vurolenatide or glp1-xten or "nb 1001" or nb1001 or "nm 002" or nm002 or xten-glp1)).mp. or Carnitine/ or (levocarnitine or "Vitamin BT" or L-Carnitine or Bicarnesine).mp. or Naltrexone-bupropion.mp.	8639
8	or/4-7 [Anti-Obesity Medication Concept]	14719
9	3 and 8 [Obesity/Overweight + Anti-Obesity Medication]	4108
10	Algeria/ or Bahrain/ or Comoros/ or Djibouti/ or Egypt/ or Iraq/ or Jordan/ or Kuwait/ or Lebanon/ or Libya/ or Libyan Arab Jamahiriya/ or Mauritania/ or Morocco/ or Oman/ or Palestine/ or Qatar/ or Saudi Arabia/ or Somalia/ or South Sudan/ or Sudan/ or Syrian Arab Republic/ or Tunisia/ or exp United Arab Emirates/ or Yemen/ or Arabs/ or Arab World/ or Africa, Eastern/ or East African People/ or East African/ or Middle East/ or Middle Eastern People/ or "Middle Eastern and North Africans"/ or Africa, Northern/ or North African People/ or North Africa/ or North African/	2120
11	(Algeria or Algerian? or Bahrain or Manama or Bahraini? or Comoros or Comores or Mayotte or Moroni or Comorian? or Shikomor? or Djibouti or Somaliland or Djiboutian? or Djiboutien? or Egypt or Cairo or "United Arab Republic" or Egyptian? or Iraq or Baghdad or Iraqi? or Jordan or Amman or Transjordan or Jordanian? or Kuwait or Kuweit or Kuwaiti? or Lebanon or Leban* or Liban* or Lubnan* or Lobnan* or Lebanese or Libya or Libia or Libyan? or Tripoli or Mauritania* or Nouakchott or Morrocco or Morocco or Ifni or Rabat or Moroccan? or Oman or Muscat or Omani? or Palestine or Gaza or Ghaza or Ghazza or West Bank or Palestinian? or Qatar or Doha or Katar or Quatar or Qatari? or Saudi? or KSA or Riyadh or Somali? or Mogadishu or South Sudan or Juba or South Sudanese or Sudan or Khartoum or Sudanese or Syria or Damascus or Syrian? or Tunisia or Tunesia or Tunis or Tunisian? or United Arab Emirates or UAE or Abu dhabi or Ajman or Dubai or Sharjah or Trucial state? or Emirati? or Yemen or Aden or Sanaa or "Sana'a" or Yemeni? or East Mediterranean or Eastern Mediterranean or EMRO or Levant or Levantine? or (MENA adj2 region?) or Arab? or Arabia or Arabian? or Arabic World or East African? or Eastern Africa or Eastern African? or Middle East or MENA or Middle Eastern? or Maghreb or North Africa? or Northern Africa? or Meghrebis or Meghrebian?).ab,cp,in,jw,kw,lg,ti.	24601
12	or/10-11 [Arab Countries Concept]	24897
13	9 and 12 [Final set, Obesity/Overweight + Anti-Obesity Medication + Arab Countries Concept]	23
14	limit 13 to yr="2023 -Current"	3 [2 after duplicates removed]