Review

The Anti-Obesity Effects of Triphala and Triphala Guggul: A Systematic Review and Meta-Analysis of Clinical Trials

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Received: 27 June 2025; Revised: 2 September 2025; Accepted: 23 September 2025; Published: 29 September 2025

Abstract: Background: Obesity is a progressively serious universal health problem requiring an impressive treatment alternative. Triphala and Triphala Guggul, which include Guggul resin, are traditional therapies suggested for controlling obesity. Their advantage however, has not yet been examined in depth in clinical trials. Methods: A systematic review and meta-analysis of controlled trials was run in accordance with PRISMA guidelines. Three main databases (PubMed, Scopus, and Web of Science) together with Google Scholar were searched up to July 2025. Eligibility was limited to controlled trials including overweight adults or patients with obesity that examine Triphala or Triphala Guggul in comparison with control interventions. Facts on body weight, body mass index, and other anthropometric measures were adapted. The quality of included studies was assessed using a modified Oxford Quality Score System (OQSS), and the risk of bias was evaluated using the Cochrane Risk of Bias tool. Random-effects meta-analysis was accomplished using RevMan 5.4 and Stata 17. Results: Fifteen studies (10 Triphala, 5 Triphala Guggul) with 800 contributors were included. Meta-analysis of five studies on oral Triphala administration reveals a statistically significant decline in body weight (mean difference = −2.4 kg, 95% CI: −4.2 to −0.6, $p = 0.01$), though with high heterogeneity ($I^2 = 91\%$). The effect on body mass index was not statistically significant ($p = 0.09$). Topical applications did not result in notable effects. Both formulations were well-tolerated with no serious adverse events documented, except for the infrequent occurrence of hypersensitivity skin reactions. Methodological quality was variable, with a third of the studies rated as low quality. Conclusions: Oral short term consumption of Triphala led to a reduction in body weight accross individuals with obesity, although its efficacy for body mass index remains indecisive. Topical administration did not exhibit significant profit. Oral Triphala becomes visible to be a safe complementary supplementation for obesity in a short period; however, the evidence is inconsistent due to variability in study quality and outcomes. Advanced high-quality, long-term studies are required to ensure effectiveness, optimal dosing, and long-term safety.

Keywords: Triphala; Guggul; Itrifal saghir; Atrifal saghir; obesity; BMI; meta-analysis; systematic review

1. Introduction

Obesity is a metabolic disorder due to an energy imbalance in the body, primarily due to a high ratio between calorie intake and energy expenditure [1]. While obesity is a risk factor for many other diseases such as type II diabetes mellitus, atherosclerosis, hyperlipidemia, cardiovascular disease, and cancer, and its prevalence according to the reports presented by WHO has been considered high, it has been opted as one of the major public health

concerns [2–5]. The pathophysiology of obesity is complicated by several factors involving genetics, nutrition, and lifestyle [6]. Adipose tissue produces a variety of hormones and cytokines, or adipokines, which affect appetite, metabolism, and inflammation. These include the energy balance hormone leptin, while pro-inflammatory cytokines are TNF-alpha and IL-6, involved in chronic inflammation. Besides, disturbed gut hormones and disturbed signaling pathways further complicate metabolic manifestations of obesity with insulin resistance and related comorbidities. Knowledge of such mechanisms will contribute to effective management [7]. To unravel the intricacies involved in this disease, it is prudent to envision obesity as a multivariate illness, resulting from the interaction of multiple factors involving eating behaviors, physical activity patterns, sociocultural factors (including income and education), stress, sleep duration at night, medical factors (hypothyroidism, Cushing syndrome, and hypothalamic obesity), and childhood and infant experiences [8]. Among the approved interventions, PPARγ agonists, recombinant human growth hormones, metformin, NSAIDs, statins, and ezetimibe have shown the potentiality for preventing visceral obesity and its consequences. However, due to issues of accessibility, costs, and side effects, several requirements for alternative medicines are escalating [4].

The extracts of herbs represent a variety of heterogeneous phytoconstituents, enabling them to act on the disease through various diversified modes of actions. The inhibition of angiogenesis by herbal medicines may prevent the development of mature adipose tissue, which depends on an extended capillary network for feeding [1]. Herbal remedies also may target hormonal and neurological signals of appetite, food consumption, energy expenditure, regulation of fat and carbohydrate metabolism, β cell function, and insulin resistance [9–15]. "Triphala" referring to a blend of three fruits (phala = fruit) is a triple herbal mixture from fruits of *Phyllanthus emblica* (amla, Euphorbiaceae), *Terminalia bellerica* (Vibhitaka, belleric myrobalan, Combretaceae), and *Terminalia chebula* (Haritaki, chebulic myrobalan, Combretaceae) in equal proportions [16]. The main indications of Triphala are promoting gastrointestinal functions such as digestion and elimination, as a bowel regulator, tonic, cleanser, and blood purifier [17,18]. A number of the traditional uses of Triphala have been scientifically proved through clinical practices by modern medicine.

These studies have demonstrated various activities such as enhancement in digestion, immunomodulation, anti-diabetes and anti-obesity, anti-hyper lipidemia, and chemoprotective potential [19–21]. In addition, in vitro and in vivo anti-inflammatory activities, hepatoprotective, antioxidant, anti-aging, and adaptogen-like activities have also been reported [21].

On another hand, Guggul (Guggulu) is an oleo-gum resin taken from *Commiphora mukul* (Syn. *Commiphora wightii*, Burseraceae) obtained from its stem and branches [22]. Modern pharmacological investigations have illuminated its hypo-lipidemic, anti-inflammatory, antioxidant, cardio-protective, anti-atherosclerotic, and anti-hyperglycemic [23]. In the context of anti-obesity effects, Traditional texts suggest combining Guggul with herbs like Triphala to enhance its impact by modulating fatty tissue metabolism [24]. It will lay down the evidence for RCTs in a systematic manner to provide a valid and comprehensive overview of the anti-obesity effects of two herbal blends from ancient times, namely Triphala and Triphala Guggul.

1.1. Phytoconstituents of Triphala and Guggul

Triphala fruit, being a combination of three fruits, comprises the elements of each of these fruits. Till date, there have been more than 170 compounds identified in Triphala [25].

1.1.1. *Phyllanthus emblica*

Amongst the three fruits, *P. emblica* had been reported to have the highest vitamin C content [26–31]. The major phenolic compounds contained in amla are gallic acid (1.5–5%) [32], mucic acid and its derivatives, corilagin, chebulagic acid (0.9–1.2%), and putranjivain A [33,34]. Tannins in *P. emblica* include emblicanin A and B, punigluconin, and pedunculagin (Figure 1) [33]. Quercetin is one of the flavonoids present [34]. Alkaloids present in *P. emblica* are phyllantin and phyllantidin [35]. *P. emblica* is rich in essential nutrients including minerals, proteins, and amino acids like proline, alanine, cysteine, glutamic acid, aspartic acid, and lysine. It also contains glucose, fiber, phosphorus, iron, calcium, carotene, nicotinic acid, and riboflavin [31,36]. The fruit pulp consists of water content 81.2%, protein 0.5%, fat 0.1%, mineral matter 0.7%, dietary fiber 3.4%, carbohydrates 14.1%, calcium 0.05%, potassium 0.02%, iron 1.2 mg/100 g, nicotinic acid 0.2 mg/100 g, vitamin C 600 mg/100 g, and pectin [18]. The *P. emblica* oil, brownish yellow in color, contains unsaponifiable matter 3.81%, sterols 2.70%, and saturated fatty acids 7.0%. The fatty acid composition includes linolenic acid 8.78%, linoleic acid 44.0%, oleic acid 28.40%, stearic acid 2.15%, palmitic acid 2.99%, and myristic acid 0.95%. The seeds also contain proteolytic and lipolytic enzymes [18].

1.1.2. *Terminalia bellerica*

Tannins like gallotannic acid, ellagic acid, and gallic acid [32] form 1.8% to 2.4% are present in *T.bellerica*. These fruits also contain lignans like termilignin, thannilignan and anolignan-B, 7-hydroxy-3,4 flavone, ethyl gallate, galloyl glucose and chebulaginic acid phenyllemblin, which usually form 0.4–0.9% of the fruit (Figure 1). Other compounds identified include: β-sitosterol, anthraquinones, glycosides like bellaricanin and carbohydrates. The oil content in fruit amounts to 30–40%, which contains palmitic, stearic, oleic and linoleic acids [18].

1.1.3. *Terminalia chebula*

Tannins, especially chebulinic acid and chebulic acid, constitute about 30% to 40% of the fruit [37]. Neochebulinic acid, corilagin, chebulagic acid, ellagic acid, punicalagin, terchebin, and terflavin A have been cited [38,39] in *T. chebula* fruits. The tannins of the fruit contain about 30–40% chebulinic acid, 13–14.3% [32], chebulic acid [37], neochebulinic acid, corilagin, and chebulagic acid, 9.4–10.8% [32,38]. In addition, the fruit contains gallic acid, 0.8–1.25% [32], ellagic acid, punicalagin, terchebin, and terflavin A (Figure 1) [18]. The tannins of myrobalan are of the pyrogallol type and exist in various states of aggregation. They show significant variations in their susceptibility to hydrolytic degradation. Major tannin components in myrobalan are hydrolysable tannins of ellagitannin-class like chebulagic acid, chebulinic acid and corilagin. It is accompanied by variable amounts of products of its complete and partial hydrolysis chebulic acid, 3,6-digalloylglycose, ellagic acid, gallic acid, β-D-glucogallin and terchebin [18]. Besides, 1,3,6-trigalloyl glycose and 1,2,3,4,6-pentagalloyl glycose have also been reported. Some constituents are present in the extract but have not been found in the fresh ripe fruits [40]. Luteolin, rutin, and quercetin have been reported among the flavonoids [40]. The presence of anthraquinones, saponins, β-D-glucogallin, amino acids, and fatty acids has also been reported [41–43]. Among carbohydrates, glucose and sorbitol are the major constituents. There are about 1% each of fructose and sucrose, a smaller amount of gentiobiose, and traces of arabinose, maltose, rhamnose, and xylose. The presence of amino acids and small quantities of phosphoric, succinic, quinic, shikimic, dihydro, and dehydroshikimic acids has also been reported [18].

1.1.4. Oleo-Gum Resin from *Commiphora mukul* (Guggul)

The secondary metabolite profile of Guggul presents a varied group of chemicals. Monoterpenes, present in Guggul essential oil, are the major compounds. The main compounds with terpene backbone structure include the sesquiterpene cadinene, mac-rocyclic diterpenes represented by cembrene and mukulol, polypodane-type triterpenes represented by myrrhanol A, B, and C, myrrhanone A and B. Unique steroids represented by E-guggulsterone, Z-guggulsterone, guggulsterol I, II, III, IV, V, and VI are also identified, which are known for their hypolipidemic and thyroid stimulating activities. From this resinous herbal material, a number of flavonoids, such as muscanone, naringenin, quercetin, and derivatives, and different lignans including sesamin and diayangambin have been isolated. Guggultetrols, a unique category of lipophilic compounds, showed a linear aliphatic tetrol structure with hydroxyl groups at C-1, C-2, C-3, and C-4 positions, representing new entry to the phytoconstituent list of Guggul (Figure 1) [23].

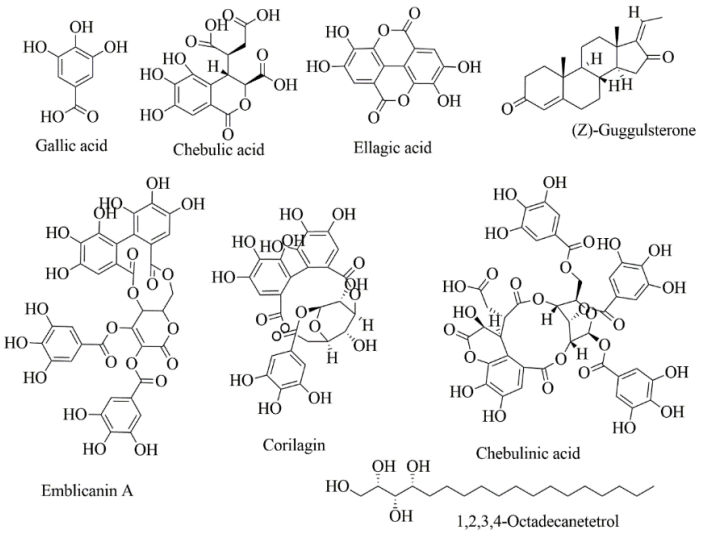

Figure 1. Major phytoconstituents of Triphala and Guggul.

2. Material and Methods

Following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [44] this systematic review and meta-analysis was carried out to enhance transparency, ensure thorough reporting, and reduce potential bias.

2.1. Literature Search Strategy

To ensure comprehensive coverage of the literature., we explored three principal databases (Web of Science, Scopus, and PubMed) for peer-reviewed papers. The search strategy used Boolean operators with the following key terms: ("Triphala" OR "Triphala Guggul" OR "Triphala Guggulu" OR "Itrifal" OR "Atrifal" OR "Otrifel") combined with ("anti-obesity" OR "antiobesity" OR "weight loss" OR "weight reduction" OR "obesity" OR "overweight" OR "body mass index" OR "BMI" OR "body weight" OR "weight" OR "waist circumference" OR "hip circumference" OR "waist-to-hip ratio" OR "WHR" OR "waist-to-height ratio" OR "WHtR"*). To catch gray literature and unindexed documents, we also included Google Scholar. This dual approach follows the best practices for systematic reviews, ensuring methodological rigor while relieving publication bias. No date or language limitations were charged originally, with the final search surrounding all documents up to 17 July 2025. Search terms were modified slightly to fulfill each database's syntax requirements. Consequences from all databases were explored, with precise recoding of search terms, databases, and selection criteria to maintain transparency and reproducibility, in accordance with PRISMA guidelines (Supplementary materials). This approach allowed a systematic and extensive identification of appropriate studies, including gray literature, for inclusion in the review.

2.2. Study Selection

The study selection procedure obeyed a systematic three-phase strategy to assure methodological rigor and lessen bias. First, all identified records were imported into EndNote software (Version 21, Thomson Reuters, New York, NY, USA) for duplicate removal, incorporating computerized deduplication following manual confirmation to ensure accurate process. Subsequently, two independent reviewers filtered the titles and abstracts of the remaining distinctive records based on predefined eligibility criteria. Discrepancies were decided via discussion or, when required, arbitration by a third reviewer. Ultimately, the full texts of potentially eligible documents were acquired and independently assessed by the same two reviewers utilizing defined rigorous inclusion and exclusion criteria. The whole selection operation was meticulously depicted in a PRISMA flow diagram, indicate the number of papers identified, screened, considered for eligibility, and finally included, besides a clear clarification for exclusion in the full-text check. This strategy followed a predefined protocol registered with PROSPERO (ID: CRD42022383215) to ensure transparency and reproducibility.

2.3. Inclusion Criteria

The inclusion criteria surrounded the following elements: (1) study design: only controlled clinical trials were considered eligible; (2) study subjects: participants diagnosed with overweight or obesity (BMI (body mass index) > 30), regardless of "age, gender, or ethnics"; (3) interventions: the treatment group received Triphala or Triphala Guggul supplements, while the control group was administered either alternative clinical treatments or a placebo; (4) outcome measurements: the primary outcomes enclosed at least one quantitative measurable factor of obesity, such as BMI, body weight (BW), waist circumference (WC), waist-hip ratio (WHR), waist-height ratio (WHtR), or hip circumference (HC), with secondary outcomes concentrating on reported adverse effects.

2.4. Exclusion Criteria

The exclusion criteria were as follows: (1) studies implicating simultaneous use of other herbal supplements with Triphala or Triphala Guggul, where the specified impacts of Triphala or Triphala Guggul could not be defined; (2) practical studies limited to pharmacological assays, animal studies, pilot trials, or cohorts; (3) case reports, conference proceedings, and review articles; (4) publications with duplicated or overlapping results; and (5) studies with data inaccuracies or unavailable full-text articles.

2.5. Quality and Bias Assessment

The methodological quality of selected studies was carefully judge using an 8-item modified Oxford Quality Scoring System (OQSS) evaluating randomization, blinding, withdrawals/dropouts, inclusion/exclusion criteria,

adverse effect reporting, and statistical methods. Each item was get −1, 0, or 1, with entire scores of 4–8 designating high-quality trials and 0–3 be elected by low quality. The risk of bias in the included trials was analyzed compatible with the Cochrane Risk of Bias Tools (Version 5.1.0). Each study allocate "low", "high" or "unclear" risk of bias across specified domains. Two independent reviewers manipulate estimation with disagreement decided through argument or a third-reviewer council.

2.6. Data Extraction

Data pull-out schedule was organized by two independent reviewers by use of a pilot form, any all discrepancies were resolved through agreement or talk with a third reviewer. Major item systematically extracted contained: (1) first author and publication year; (2) study location; (3) trial design characteristics such as blinding and allocation method; (4) sample size, accounting for attrition; (5) intervention duration; (6) formulation and dosage of Triphala or Triphala Guggul; (7) outcomes, specifically baseline and post-intervention means ± standard deviation; and (9) reported adverse events and dropout rates. In cases of missing data, the corresponding author was contacted twice via email for clarification. All extracted data were meticulously examined from the main paper and classified in an Excel sheet based on the PICOS (Population, Intervention, Comparator, Outcomes, Study Design) substructure to ensure methodological rigor and accuracy.

2.7. Statistical Analysis

RevMan 5.4 and Stata 17 software were employed for data analysis. Study heterogeneity was estimated using the Q-test, with heterogeneity quantified by the I^2 statistic and τ^2. Considering that the heterogeneity among trials was high ($I^2 > 50\%$), a random-effects model was involved for all analyses. For continuous variables, the mean difference (MD) was utilized, with effect sizes expressed as mean difference and corresponding 95% confidence intervals (CI). Overall effects were evaluated using the Z statistic (*p*-value). Publication bias was assessed using Begg's test (*p*-value) and Egger's test (*p*-value) in Stata 17.0. Review Manager 5.4.1 was used to evaluate the quality of the included literature.

3. Results

3.1. Search Result

Figure 2 offers a flow diagram representing the systematic selection methodology for trials specified through electronic databases. An initial search yielded 191 publications considered potentially pertinent, from which A total of 129 articles were selected for title and abstract screening following the removal of duplicates. Afterward, 45 full-text articles underwent a thorough evaluation to assess their adherence to the predefined eligibility criteria. The last passage included 10 controlled clinical trials examining single preparations of Triphala and 5 controlled clinical studies exploring Triphala Guggul formulations.

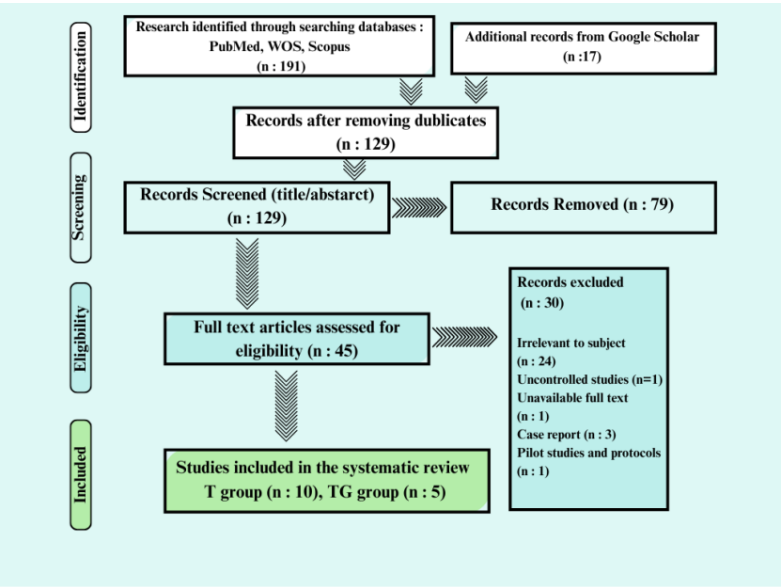

Figure 2. Flow diagram of the literature search according to items in the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guideline.

3.2. Study Characteristics

The study characteristics and methodological precision of the included trials are summarized in Table 1 for the 10 studies involving 537 patients treated with Triphala alone (T group) and in Table 2 for the 5 studies incorporating 263 patients treated with Triphala plus Guggul (TG group). Based on the 8-item modified OQSS scale, six controlled trials in the T group and four in the TG group were ranked as good to excellent quality. Geographically, among the five studies in the TG group, four were conducted in India and one in Italy, whereas in the T group, seven studies were from India, two from Iran, and one from Thailand. The studies were published between 2012 and 2020, Most of the trials conducted were small-scale, including only one study in the T group with less than 100 participants. The age range of participants in most studies varied 20 to 60 years. The study durations range from 10 to 90 days. Three trials administered Triphala via the dermal route (massage with powder) over 10 to 14 days, while the remaining studies assessed oral administration in different formulations, including powder, decoction, extract, liquid preparations, granules, and standardized tablets. Dietary limitations were imposed in one study, whereas another one incorporated physical exercise regimens. Notably, the actual dosage of Triphala was not determined in three trials.

In the TG group, three studies concentrated on obese patients, one on hyperlipidemic patients, and one on individuals with low-to-moderate cardiovascular risk. In the T group, dyslipidemia was focused in one study, while obesity was considered in nine.

3.3. Quality Assessment

A crucial evaluation of the methodological quality across the included studies revealed noteworthy deviations. Among the ten Triphala trials, six investigations exhibited good to excellent quality, reaching modified OQSS quality scores between 4 and 8. Conversely, the remaining four studies scored 3 or below, indicating a relatively lower level of methodological robustness. Similarly, across the five Triphala Guggul trials, four studies achieved good to excellent quality ratings, whereas the remaining trials scored 3 or below, highlighting the necessity for enhanced methodological clarity and rigor in future research endeavors (Figure 3).

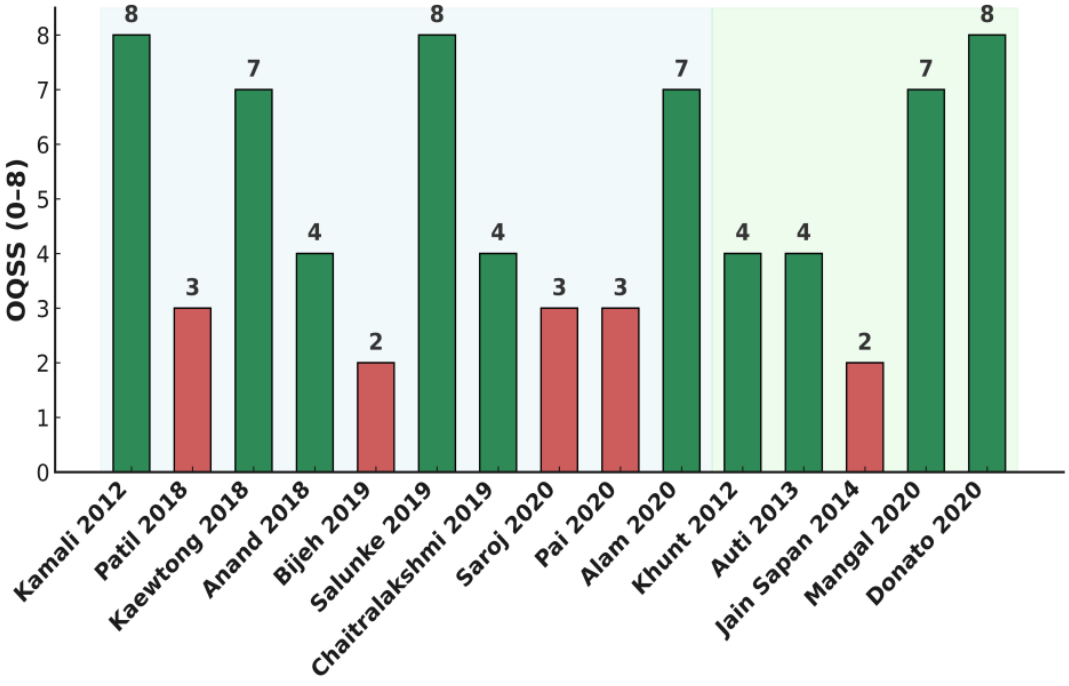

Figure 3. Quality assessment based on OQSS (0–8) for included studies [24,45–58].

Table 1. Characteristics of clinical trials of Triphala.

Author (year)	Country	RCT Design	Sample Size	Age (year)	Health Status	Duration	Products/Intervention	Outcomes		Side Effects
								Outcome Measurement	*p*-Value	
Good to Excellent Quality RCTs										
Kamali 2012 [45]	Iran	Double-blind, randomized controlled trial	62	16–60	Obese patients with BMI between 30 to 50 kg/m^2	12 weeks	Triphala powder, 5 g twice daily	BW [a]↓ BMI [b]↓ WC [c]↓ HC [d]↓	>0.001 >0.001 >0.001 >0.001	No significant change in renal and liver function tests
Kaewtong 2018 [46]	Thailand	Double-blind, randomized controlled trial	40	20–60	Stage 1 obese patients	8-week	Triphala powder, 1800 mg per day	Triphala did not statistically significant change BMI and WC		Not described
Anand 2018 [47]	India	Open label three Arm controlled study	60	25–50	Central obesity	14 days	Topical massage with Triphala powder, 20 min once a day + diet restriction.	BMI↓ The changes in WC, HC and WHR [e] were not significant.	0.01	Not described
Salunke 2019 [48]	India	Prospective, randomized, three arm, parallel, placebo controlled, double blind study	120	18–60	Patients with BMI > 25 kg/m^2	90 days	Overweight individuals received 500 mg tablets of aqueous extract twice daily Obese individuals received 500 mg tablets of aqueous extract thrice daily	BW↓ WC↓ HC↓ Mid-thigh circumference↓ Body fat percentage↓ The changes in WHR, neck and mid-upper arm circumferences were not significant	<0.01 <0.01 <0.01 <0.05 <0.01	No adverse effects
Chaitralakshmi 2019 [49]	India	Simple prospective comparative clinical study	40	18–60	Patients with BMI > 25 kg/m^2	10 days	Topical massage for 45 min with Triphala powder for 10 days	BMI↓ WC↓ WHR↓ Skin fold thickness↓	0.0005 0.0005 0.020 0.0005	Not described
Alam 2020 [50]	India	Randomized single blind controlled clinical trial	30	20–60	Patients with dyslipidemia	45 days	Triphala powder, 10 g twice daily	BW↓	<0.05	No significant change in renal and liver function tests
Poor to Low Quality RCTs										
Patil 2018 [51]	India	Comparative, randomized, clinical study	30	16–60	Obese patients	14 days	Topical massage with Triphala powder, 45 min Once a day	BW↓ (1.03%) BMI↓ (1.86%) Chest circumference↓ (1.63%) Abdominal circumference↓ (5.21%) HC↓ (2.16%) Mid-thigh circumference↓ (6.36%) Mid arm circumference↓ (3.03%) Biceps skin fold thickness↓ (13.09%) Triceps skin fold thickness↓ (13.42%) Sub-scapular skin fold thickness↓ (10.5%) Supra iliac skin fold thickness↓ (10.34%)	Not reported	Not described

[a] Body Weight, [b] Body Mass Index, [c] Waist Circumferences, [d] Hip Circumference, [e] Waist Hip Ratio, [f] Waist Height Ratio. Note: ↓ indicates a decrease.

Table 1. *Cont.*

Author (year)	Country	RCT Design	Sample Size	Age (year)	Health Status	Duration	Products/Intervention	Outcomes		Side Effects
								Outcome Measurement	*p*-Value	
Bijeh 2019 [52]	Iran	Open label, placebo controlled study	35	18–23	Obese women with BMI of 30 or more	4 weeks	Triphala powder, 5 g twice daily (before breakfast and before bedtime) + training	Body fat percentage↓ WHR↓ WC↓	0.025 0.001 0.042	Not described
Saroj 2020 [53]	India	Single centre, open label, randomized, interventional, clinical trial	30	20–60	Obese patients with BMI of 30 or more	30 days	Triphala decoction, 50 mL twice daily (morning and evening)	BW↓ BMI↓ WC↓ WHR↓ WHtR [f]↓	0.0001 0.0001 0.0001 0.0255 0.0255	No adverse effects
Pai 2018 [54]	India	Randomized, open labeled, controlled clinical Study	90	16–60	Obese patients with BMI of 30 or more	48 days	Processed triphala decoction with honey, 48 g in 2 divided doses (morning and evening with empty stomach)	BW↓ BMI↓ WC↓ HC↓	<0.05 <0.05 <0.05 <0.05	Not described

[a] Body Weight, [b] Body Mass Index, [c] Waist Circumferences, [d] Hip Circumference, [e] Waist Hip Ratio, [f] Waist Height Ratio. Note: ↓ indicates a decrease.

Table 2. Characteristics of Studies of Triphala Guggul.

First Author (Year)	Country	RCT Design	Sample Size	Age (year)	Health Status	Intervention Duration	Intervention Products	Outcomes		Side Effects
								Outcome Measurement	*p*-Value	
Good to Excellent Quality RCTs										
Khunt 2012 [55]	India	Randomized clinical study	36	15–60	Obese patients	21 days	Triphala + Guggul, 2, 3 times a day before meal + a purgation technique from Ayurveda	BW [a]↓ (3.41% reduction) BMI [b]↓ (3.83% reduction) Chest circumference↓ Abdominal circumference↓ Hip circumference↓ Mid-thigh circumference↓ Mid-calf circumference↓ Mid-arm circumference↓ Biceps skin fold thickness↓ Triceps skin fold thickness↓ Scapular skin fold thickness↓ Thigh skin fold thickness↓	<0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001 <0.001	Not described

[a] Body Weight, [b] Body Mass Index. Note: ↓ indicates a decrease.

Table 2. *Cont.*

First Author (Year)	Country	RCT Design	Sample Size	Age (year)	Health Status	Intervention Duration	Intervention Products	Outcomes		Side Effects
								Outcome Measurement	*p*-Value	
Auti 2013 [56]	India	Randomized controlled study.	19	20–60	Patients with hyperlipidemia	21 days	Triphala + Guggul, 500 mg 2 or 3 times a day (3 g/day) before meals	BW↓ BMI↓ Abdominal girth↓ Reduction in body fat and circumferential measurements (chest, hip, pelvis, mid-thigh, and leg) were insignificant	<0.01 <0.01 <0.01	Not described
Mangal 2020 [57]	India	Observational study	58	12–60	Patients with obesity	12 weeks	Triphala + Guggul 1 g, (2 tablets of 500 mg), 3 times a day	BMI↓ (the mean BMI reduce from 29.91 to 27.18) Abdominal circumference↓ Chest circumference↓ Thigh circumference↓ Triceps circumference↓	Not reported	No adverse effects
Donato 2020 [24]	Italy	Placebo-Controlled, double-Blind, randomized trial	90	28–69	Patients with low-moderate cardiovascular risk	3 months	200 mg Guggul and 450 mg Triphala extracts 3 times daily	The changes in BMI and WC were not significant		No changes in renal function or electrolytes were reported. Cases of hypersensitivity rash and facial edema were seen.
Poor to low quality RCTs										
Jain Sapan 2014 [58]	India	Randomized, clinical study	60	25–55	Patients with obesity	60 days	Triphala + Guggul, 500 mg, 3 times a day	BMI↓ (percent of relief: 68.07)	Not reported	No adverse effects

[a] Body Weight, [b] Body Mass Index. Note: ↓ indicates a decrease.

3.4. Risk of Bias Assessment

The aassessment of bias risk for the incorporated trials depicted in Figure 4. employing the Cochrane Risk of Bias tool, the overall methodological quality of the included studies was assessed as moderate. Out of the 15 studies examined, one exhibited a high risk of bias in random sequence generation, though ten studies were believed to have an unclear risk in this domain. Concerning the concealment of allocation, ten studies were classified as unclear, while one study was recognized as high risk. In the domain of blinding participants and personnel, eleven studies were placed as high risk, and four were tagged as low risk. Similarly, for the blinding of outcome assessment, eleven studies were assessed as high risk, with four studies demonstrating as low risk. In the domain of incomplete outcome data, six studies displayed low risk, six were unclear, and three were categorized as high risk. Selective reporting was estimated as low risk in four studies, whereas eleven were unclear, with no studies exhibiting high risk. For other potential sources of bias, one study was identified as high risk, and nine were unclear. These findings suggest that the central methodological constraints within the retained studies originate from loss of adequate data reporting or insufficient blinding, particularly in domains related to blinding, which may compromise the internal validity of the meta-analytic outcomes.

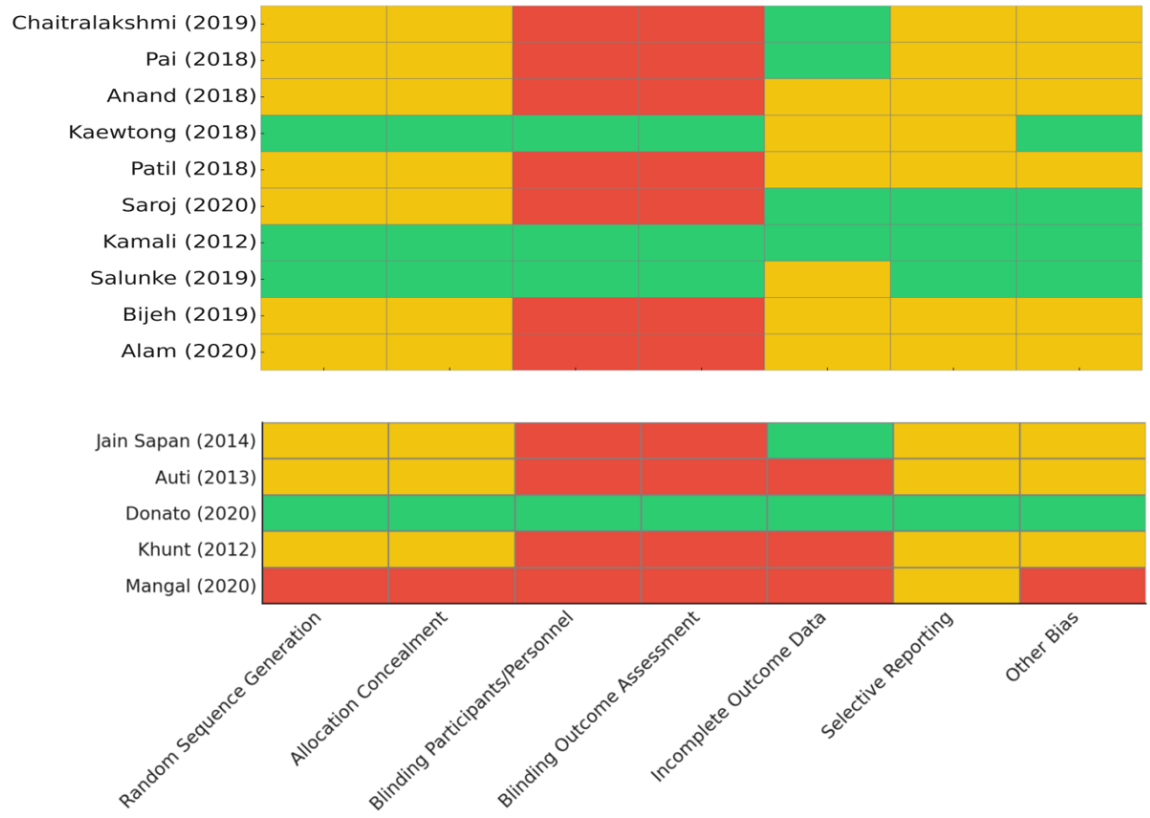

Figure 4. Risk of Bias Traffic Light Chart (Cochrane 5.1 Domains) presents a visual summary of the risk of bias across 15 included studies [24,45–58], assessed using the Cochrane Handbook 5.1 criteria across seven domains. Colors represent the level of bias: Green = Low risk, Yellow = Unclear risk, Red = High risk.

3.5. Meta-Analysis of Subgroups of Changes in Body Weight and BMI

A subgroup meta-analysis was conducted to assess the efficacy of oral and topical interventions. The oral intervention subgroup exhibited a statistically significant decrease in body weight (mean difference = −2.4 kg, Z = −2.80, $p = 0.01$), though notable heterogeneity was detected ($I^2 = 91\%$). Conversely, no significant effect was detected for body mass index (BMI) ($p > 0.05$). In contrast, topical interventions, such as external massage, did not exhibit significant effects on either BMI or body weight ($p > 0.05$), with intermediate heterogeneity reported for BMI ($I^2 = 52\%$) (Figure 5). Publication bias was scrutinized employing Begg's rank-correlation and Egger's regression tests, neither of them showed any significant effects related to small sample sizes across subgroups ($p > 0.05$). However, the topical BMI subgroup displayed a marginal result in Begg's test ($p \approx 0.07$). Due to the limited number of studies available, in specific subgroups particularly the topical body weight subgroup ($n = 2$) the statistical strength of these analyses was constrained, requires a detailed interpretation of the findings (Tables 3 and 4).

Table 3. Effects of Triphala on BMI and BW in patients with obesity.

Intervention Type	Outcome	Study	Mean Difference	95% CI Lower	95% CI Upper	Standard Error (SE)	Precision (1/SE)
Oral	BMI	Kamali 2012 [45]	−3.3	−4.2	−2.4	0.459	2.179
		Kaewtong 2018 [46]	−0.1	−1.2	1.0	0.561	1.783
		Bijeh 2019 [52]	−0.5	−2.45	1.45	0.995	1.005
		Saroj 2020 [53]	−0.5	−0.7	−0.3	0.102	9.804
	BW	Kamali 2012 [45]	−4.8	−6.1	−3.5	0.661	1.513
		Salunke 2019 [48]	−1.2	−2.3	−0.1	0.587	1.704
		Alam 2020 [50]	−3.7	−5.1	−2.3	0.704	1.42
		Bijeh 2019 [52]	−1.6	−3.5	0.3	NR	NR
		Saroj 2020 [53]	−0.7	−1.3	−0.2	0.265	3.774
Topical	BMI	Patil 2018 [51]	−0.2	NR	NR	NR	NR
		Chaitralakshmi 2019 [49]	0.08	−0.25	0.41	0.168	5.952
		Pai 2020 [54]	−1.7	NR	NR	NR	NR
	BW	Anand 2018 [47]	−0.09	NR	NR	NR	NR
		Patil 2018 [51]	0.04	−1.45	1.53	0.76	1.316
		Pai 2020 [54]	−0.55	NR	NR	NR	NR

NR = Not reported.

Table 4. heterogeneity indices, publication bias tests and overall effect Z-scores.

Subgroup	Studies (n)	I^2 (%)	τ^2	Z (p)	Begg's Test (p)	Egger's Test (p)
Oral interventions—BMI	4	57%	0.22	–1.68 (p = 0.09)	1.00 (n.s.)	0.61 (n.s.)
Oral interventions—Body Weight	5	91%	3.17	–2.80 (p = 0.01)	0.48 (n.s.)	0.20 (n.s.)
Topical interventions—BMI	4	52%	0.19	–0.84 (p = 0.40)	0.07 (n.s.)	0.23 (n.s.)
Topical interventions—Body Weight	2	N/A †	N/A †	N/A †	N/A †	N/A †

n.s. = not significant (p > 0.05). N/A †: not applicable due to too few studies in subgroup.

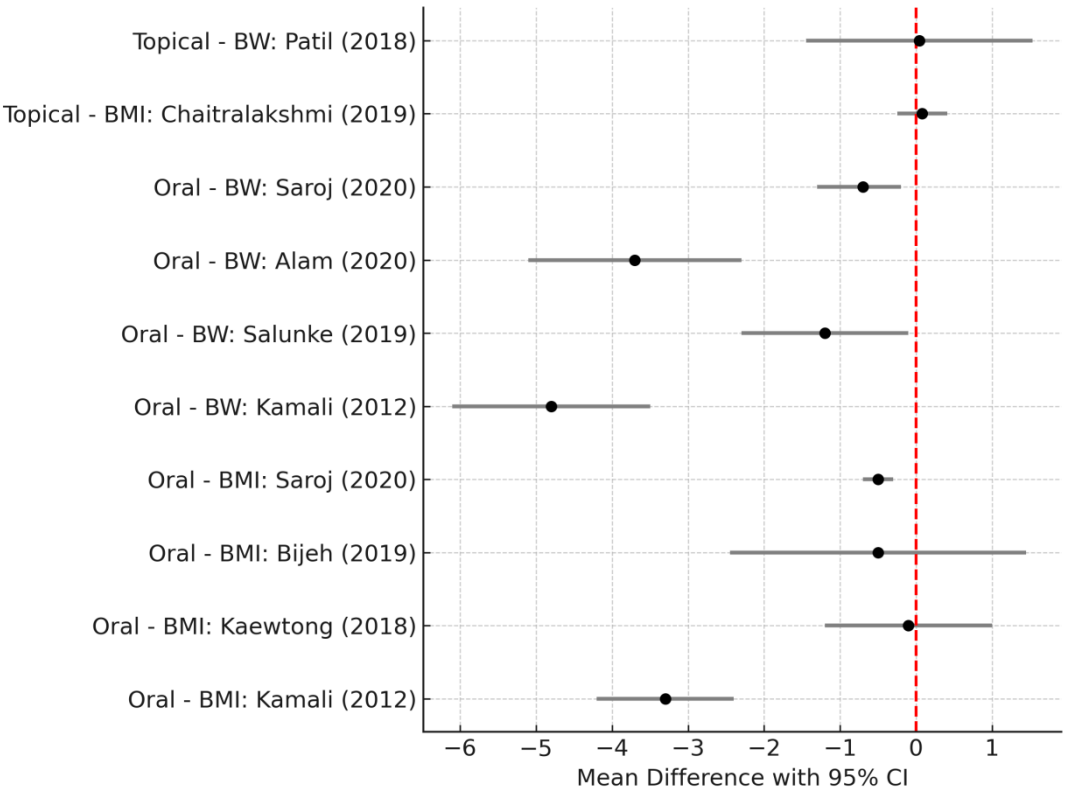

Figure 5. Forest chart of Meta-analysis estimates [45,46,48–53].

4. Discussion

4.1. Main Findings of the Review

This meta-analysis reveals that oral administration of Triphala results in a statistically significant reduction in body weight relative to control interventions. The combined analysis from five controlled trials revealed a notable and consistent tendency for participants to experience weight loss ($Z = -2.80$, $p = 0.01$), though substantial heterogeneity ($I^2 = 91\%$) suggests variability in treatment effects across studies. Conversely, the pooled analysis of four studies examining BMI in the oral subgroup did not achieve statistical significance ($Z = -1.68$, $p = 0.09$; $I^2 = 57\%$), mirroring greater variability and reduced rationale in this outcome. The non-significant BMI conclusions may be due to elements such as modest effect sizes, moderate heterogeneity, and the limited number of trials, which may have diminished statistical power. Despite this, the overall direction was on weight reduction, offering a potential therapeutic advantage that deserves further investigation. In contrast, topical Triphala interventions, evaluated in fewer studies, showed no significant effects on body weight or BMI, conceivably due to limited systemic absorption of bioactive compounds and shorter treatment durations.

A noteworthy result of this review is the differential efficacy between oral and topical Triphala administration. While the oral route yielded a statistically significant mean weight reduction of approximately 2.4 kg (combined mean difference ≈ -2.4 kg, $Z = -2.80$, $p = 0.01$), topical application did not attain significant changes in either weight or BMI ($p > 0.05$). Although some particular trials declared temporary progress in anthropometric measures (e.g., BMI, waist-hip ratio, and skinfold thickness) following topical application, these effects were inconsistent across studies. The lack of a vigorous effect with topical use may be attributed to short intervention periods (typically 1–2 weeks), minor physiological changes (e.g., temporary fluid redistribution rather than sustained fat loss), or poor systemic bioavailability of active phytochemicals.

These findings emphasize that clinically expressive weight loss has a greater chance of happening with oral Triphala supplementation, whereas topical applications alone lack sufficient evidence for obesity management. This distinction has practical implications, indicating that therapeutic efforts should focus on prioritizing oral administration (potentially in conjunction with lifestyle modifications) rather than ponderous topical treatments with questionable effectiveness.

Furthermore, examinations of heterogeneity and publication bias defended the robustness of these conclusions. While notable heterogeneity was observed in oral-intervention analyses, neither Begg's nor Egger's tests indicated significant publication bias (both $p > 0.05$). A borderline result on Begg's test ($p \approx 0.07$) in the topical BMI subgroup proposed a potential small-study effect, though this was not approved by Egger's test and remains inconclusive given the limited number of studies. Overall, the lack of considerable publication bias backs the validity of the finding that oral Triphala is efficacious for weight management, whereas topical applications yield negligible effects.

The robustness of our results is moderated by the marked variability in methodological quality across the included trials. Employing the modified Oxford Quality Scoring System (OQSS) to assess study rigour, one-third of the controlled trials (5 out of 15) were classified as poor to low quality (scores ≤ 3), described by small sample sizes, open-label approach, and other restrictions that may raise bias. Conversely, several trials indicated high methodological rigor, achieving OQSS scores of 4–8, indicative of good to excellent study design and comprehensive reporting. Notably, the higher-quality studies consistently sustained the efficacy of Triphala, strengthening confidence in the gained outcomes. However, the Cochrane risk-of-bias assessment demonstrated widespread methodological weakness throughout the wealth of evidence available. A considerable proportion of trials poorly addressed blinding of participants and personnel, with almost more than half classified as high risk in this domain and the rest supplying incomplete detail. Furthermore, blinding of outcome evaluators was often missing, and allocation concealment was inadequately defined in several trials, growing concerns about potential selection bias. Many trials also exhibited insufficient reporting, with more than half failing to enough document attrition rates or pre-specified outcomes, resulting in an "unclear" risk rating in several domains. These methodological shortcomings diminish the reliability of the findings, specifically considering that inadequate blinding may overstate effect sizes in trials with complementary treatment due to placebo effects or reporting biases.

It is important to exercise caution when interpreting positive outcomes from lower-quality trials, as some reported advantages of Triphala and Triphala Guggul may be exaggerated. Nevertheless, sensitivity analyses limited to higher-quality trials sustained the finding that these interventions indicate anti-obesity consequences, suggesting that the primary outcomes remain positive despite methodological diversity. To enhance the validity

of prospective research, we recommend employing robust double-blind approaches, providing reasonable randomization and allocation concealment, and following thorough outcome reporting.

Another vital concern is the notable heterogeneity analyzed in the meta-analyses. For instance, the pooled effect of oral Triphala on body weight exhibited high heterogeneity (I^2~91%), mirroring large variability in treatment effects among trials. Intermediate heterogeneity was depicted for oral BMI (I^2~57%) and topical BMI (I^2~52%), highlighting significant discrepancies in results. These contrasts originate from variations in study protocols, including differences in Triphala dosage (ranging from 1.8 g/day to 20 g/day), formulation (capsules, powders, or decoctions), treatment duration (10 days to 3 months), and adjunct interventions (e.g., concurrent dietary or exercise modifications). Additionally, the variation in participant characteristics, with studies registering volunteers with central obesity, metabolic syndrome, or uncomplicated obesity, contributes to output variability. The level of heterogeneity indicates that the effectiveness of Triphala may depend on the specific context in which it is used, and affected by elements such as concurrent treatments and baseline patient characteristics. While random-effects modeling furnished an aggregate assessment of treatment effects, the wide prediction intervals imply that clinical answers may vary from significant to negligible.

These findings emphasize the necessity for standardized research approaches in future research, including uniform dosing protocols, well-defined populations, and grouped analyses based on baseline obesity grade. Such revisions would enhance the precision of meta-analytic estimations and help to reach more conclusive findings about the therapeutic potential of Triphala.

4.2. Safety and Tolerability

The safety profile of any obesity intervention is a crucial facet that must be prioritized, and the findings of this review point out that both Triphala and Triphala Guggul are generally safe and well-tolerated in short-term consumption. The trials unequivocally demonstrated that there were no serious adverse events directly linked to either formulation. Similarly, several studies demonstrated no significant changes in clinical and laboratory operations, including liver and kidney function tests, implying no end-organ toxicity during the usage course. Multiple controlled trials explicitly recorded no adverse events in the treatment groups, a remarkable statement given the relatively high doses allocated in some trials (up to 20 g/day of Triphala powder). This observation presents a wide safety margin for these natural remedies, for periods lasting between one and three months. Traditional Ayurvedic literature believes that Triphala is a mild formulation that participants typically tolerated the medicine with no gastrointestinal or other commonly occurring adverse effects reported. While benign gastrointestinal symptoms were not always systematically documented, none of the trials underscored such events as perilous situations.

The only negative effect declared in a trial of Triphala Guggul was hypersensitivity reactions, including skin rashes and facial swelling. Such allergic answers, though mild and self-limiting, deserve clinical attention, as Guggul is thought to potentially cause allergic dermatitis in sensitive individuals. Healthcare practitioners must accordingly observe for the manifestation of hypersensitivity when starting Triphala Guggul supplementation. Notably, a similar study [24] reported no adverse alterations in kidney function or electrolyte plasma levels, further supporting the metabolic safety of the formulation. No other trials in the present review recognized distinctive adverse effect trends, for example, stimulant-like reactions, cardiovascular events, or abnormal paraclinical findings. The lack of meaningful adverse effects is greatly optimistic, especially in contrast to standard pharmaceutical weight-loss treatments, which often involve significant risks.

4.3. Mechanisms of Action

The anti-obesity effects of Triphala and Triphala Guggul involve an intricate interaction of biological modes of action that target adipogenesis, lipid metabolism, endocrine regulation, and gastrointestinal health [59,60]. These mechanisms of action offer scientific evidence to highlight outcomes observed in clinical trials, aligning with both traditional Ayurvedic and Persian Medicine codes and modern biomedical knowledge of obesity. Triphala has demonstrated inhibitory effects on adipocyte differentiation and lipid accumulation in preclinical prototypes [59]. Studies indicate that Triphala extracts downregulate key adipogenic transcription factors, including peroxisome proliferator-activated receptor gamma (PPARγ) and CCAAT/enhancer-binding protein alpha (C/EBPα), thus arresting adipogenesis in 3T3-L1 preadipocytes [61]. Furthermore, individual members of formulation donate characteristic metabolic consequences: *Terminalia chebula* has been shown to diminish lipid accumulation by downregulating fatty acid synthase (FAS) and glucose transporter 4 (GLUT4) while upregulating carnitine palmitoyltransferase-1 (CPT-1) to facilitate fatty acid oxidation [62]. Similarly, *Phyllanthus emblica*

inhibits adipogenic markers such as PPARγ, adiponectin, and fatty acid-binding protein 4 (FABP4), while enhancing lipolysis via modulation of lipid metabolism–related genes [60,63].

Beyond adipocyte regulation, Triphala possesses powerful antioxidant and anti-inflammatory effects owing to its high polyphenolic content, including gallic acid, ellagic acid, chebulinic acid, and tannins [64]. These properties are particularly important due to the link between obesity, oxidative stress, and chronic low-grade inflammation, which contribute to adipose tissue dysfunction and insulin resistance [65]. By balancing reactive oxygen species (ROS) and inhibiting inflammatory mediators, Triphala may improve insulin sensitivity, modulate adipokine secretion, and relieve metabolic dysfunction, thereby easing weight loss [66]. Another proposed mechanism involves gut microbiota modulation, as Triphala contains polyphenols and dietary fibers that act as prebiotics [65]. Empirical evidence indicates that Triphala supplementation encourages the growth of healthful gut bacteria, such as Lactobacillus and Bifidobacterium, while increasing short-chain fatty acid (SCFA) production, which supports the integrity of the gut barrier and helps regulate systemic metabolism [67]. The gut-adipose axis is believed to play a significant role in the reduction of body fat and enhancements in metabolic function [68]. In the Ayurvedic outlook, Triphala is famous for its deepana (digestive-stimulating) and rechana (mild laxative) effects, which are attributed to its biological properties, including gastrointestinal motility improvement, nutrient absorption efficiency, and caloric elimination [61]. Evidence from clinical trials additionally secures its contribution to better lipid levels and glycemic management, pointing to optimistic effects on hepatic fat metabolism and insulin response [69]. Triphala Guggul mixes these agents with guggul's lipid-lowering and thyroid-stimulating characteristics [70]. The main bioactive compound in guggul, (Z)-guggulsterone, enhances thyroid function by stimulating triiodothyronine (T3) and thyroxine (T4) levels, boosting iodine uptake, and triggering thyroid peroxidase. Since thyroid hormones play a key role in regulating basal metabolic pattern and fat decomposition, adding guggul could enhance Triphala's anti-obesity benefits by boosting energy expenditure [71–74]. This dual action delivers a hypothetical principal for the superior efficacy of Triphala Guggul in clinical settings. Other phytochemicals, including chebulic acid and gallic acid, may additionally function by modulating PPAR pathways and suppressing adipogenic enzymes such as protein phosphatase 1 catalytic subunit beta (PPP1CB) [75,76]. While direct clinical evidence for these mechanisms of action is limited, the consistency of preclinical data with therapeutic effects supports the claim for Triphala and Triphala Guggul as a plausible anti-obesity medication. However, further mechanistic studies in human models are required to ensure these pathways and clarify the detailed involvement of each component. Such research would strengthen the evidence base for combining these traditional mixtures into evidence-based obesity management approaches.

4.4. Methodological Limitations of the Evidence

Several methodological limitations contextualize the findings of the present review. The interpretative strength of the subgroup analyses was principally limited by the inadequate number of trials, a subject especially salient for topical interventions and BMI outcomes. This scarcity largely reduced the statistical power required to achieve compatible treatment effects. A further substantial restriction was the marked heterogeneity presented in the pooled analyses for body weight and BMI. This elevated heterogeneity (I^2 = 91% for body weight) probably derives from clinical and methodological dissimilarities among the trials, including deviations in design, sample size, treatment duration, dosage forms, and simultaneous use of diet or exercise. Additionally, other constraints concerning the quality and perfection of the available data, such as missing standard deviations or baseline characteristics, prevented the inclusion of several trials in quantitative syntheses, potentially biasing the overall effect estimates. Furthermore, several limitations should be considered. Many trials had methodological flaws, particularly in how groups were assigned and concealed (allocation concealment) and whether participants were blinded, which could systematically skew the results. Second, because the studies were short (lasting only 10 to 90 days), we cannot determine if weight loss from Triphala is effective or sustainable in the long term. Furthermore, the methodological rigor of several included trials was suboptimal, with an unclear or high risk of bias in critical domains like allocation concealment and blinding, raising worries about the potential for systematic error in outcome reporting. The short duration of many trials (10 to 90 days) also shows a substantial restriction, blocking decisive judgments on the long-term effectiveness and imagining Triphala for weight reduction. While the current conclusions mean that short-term usage is unhazardous, there is just one study with 3-month duration, with multiple studies lasting fewer than eight weeks. This poor follow-up period precludes vigorous judgments about long-term safety. Accordingly, the next experiments must incorporate a prolonged follow-up period and employ a systematic protocol for adverse event recording to thoroughly prove the safety profile of these interventions in an enormous and additional diverse population.

5. Conclusions

This systematic review and meta-analysis provides a critical synthesis of the current evidence on the anti-obesity effects of Triphala and Triphala Guggul. The findings indicate that oral supplementation with Triphala can lead to a statistically significant reduction in body weight in the short term. This effect, coupled with a favorable safety profile and the absence of serious adverse events, positions Triphala as a promising complementary and alternative medicine for weight management. The distinction between administration routes is crucial; while oral intake shows promise, topical application lacks robust evidence of efficacy, likely due to poor systemic absorption of active compounds. The addition of Guggul did not consistently demonstrate superior effects in the available studies, though its potential mechanisms for enhancing metabolism warrant further investigation. However, the clinical application of these findings is tempered by significant limitations. The high heterogeneity among studies, attributable to variations in dosage, formulation, trial duration, and participant characteristics, precludes definitive clinical recommendations. Furthermore, the methodological rigor of many included trials was suboptimal, with common flaws in blinding and allocation concealment raising the risk of bias. Therefore, while these traditional formulations hold therapeutic potential, they cannot yet be recommended as a standalone treatment for obesity. Future research must prioritize well-designed, double-blind, placebo-controlled RCTs with larger sample sizes, longer follow-up periods, standardized interventions, and rigorous adverse event reporting. Such studies are essential to conclusively determine the efficacy, optimal dosage, and long-term safety of Triphala and Triphala Guggul, ultimately bridging the gap between traditional medicine and evidence-based clinical practice.

Supplementary Materials: The following supporting information can be downloaded at https://media.sciltp.com/articles/others/250929153729497 7/JMNP-2025-000016-Supplemantary_material.pdf.

Author Contributions: A.S. contributed to conceptualization, methodology, investigation, and original draft preparation. S.A. supervised the study, provided project administration, validation, and reviewed and edited the manuscript. P.M. assisted in data curation, formal analysis and original draft preparation. N.S. contributed to methodology, validation, and manuscript review. C.d.O. performed formal analysis, data interpretation, and critical revisions. E.A.S. participated in writing review, editing, visualization. All authors have read and agreed to the published version of the manuscript.

Funding: This study was funded by the Economic and Social Research Council of United Kingdom [Financing code: ES/T008822/1].

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: All data generated or analyzed during this systematic review and meta-analysis are included in this published article (and its supplementary information files). The primary data are available from the original clinical trials cited in the reference list.

Conflicts of Interest: All authors report no conflict of interest.

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