



Fig. 1: Flowchart of included studies

given to rule out the duplication. The critical review has been made on the selected articles using the Critical Appraisal Skills Programme [10] which is appropriate to the study design.

A critical appraisal of the identified articles

This study was used to follow the narrative review format since the possibility of heterogeneity of the articles included by enabling the theoretical and contextual review of the topic. All the articles included have similar criteria to classify the overweight/obesity based on the BMI and also guidelines for the management of obesity in adults [11-14].

RESULTS

A total of 115 articles were identified after the systematic search after removing the duplicates it was around 70. Then, nine abstracts have been retained after the screening based on the eligibility criteria and

the same selected for critical appraisal was made on the full text and finally, four retained and included in this review (Fig. 1).

All the selected articles were published by the authorities belong to the developed countries including the American Association of Clinical Endocrinologists and American College of Endocrinology (AACE/ACE; last updated on 2016) [11], European Practical and Patient-Centred Guidelines (last updated on 2019) [12], National Institute for Health and Care Excellence (NICE; last updated on 2014) [13], and National Health and Medical Research Council (NHMRC; last updated on 2013) [14].

Guidelines for the management of overweight and obesity

All the guidelines concerning with the management of overweight/obesity among the adults and met similar criteria about the BMI classification. The NHMRC [14] and AACE/ACE [11] recommendations based on the BMI (i.e., overweight BMI: 25-29.9; obesity BMI: ≥ 30); however, weight loss medications (if BMI > 27 [11] and/or BMI > 28 [14]) and bariatric surgery (if BMI ≥ 35 [11] and/or BMI > 40 [14]) were recommended in addition to the lifestyle changes including diet, physical activity, and behavioral changes (Table 1).

Table 1: Management guidelines for weight loss in obesity based on BMI in adults

BMI	AACE/ACE	NHMRC
Overweight BMI: 25-29.9	*	***
Obesity BMI: ≥ 30	**	***

AACE/ACE: American Association of Clinical Endocrinologists and American College of Endocrinology, BMI: Body mass index, NHMRC: National Health and Medical Research Council. *Lifestyle therapy - reduce calorie healthy meal plan/physical activity/behavioral interventions, **weight loss medications, consider if lifestyle therapy fails to prevent progressive weight gain (BMI > 27), bariatric surgery if BMI ≥ 35 , ***lifestyle change - reduced energy intake, physical activity, and behavioral change; weight loss medication if BMI > 28 , bariatric surgery if BMI > 40

Interestingly, WC is the additional criteria in the European Practical and Patient-Centred Guidelines [12] and NICE [13]. The recommendations have been according to both BMI and WC, however, European Practical and Patient-Centred Guidelines restricted the WC with two categories (i.e., men < 94 cm and women < 80 cm; men ≥ 94 cm and women ≥ 80 cm) [15]. On the other hand, the NICE categorized the WC in three categories (for men, WC of < 94 cm is low, 94-102 cm is high, and more than 102 cm is very high; for women, WC of < 80 cm is low, 80-88 cm is high, and more than 88 cm is very high). Both recommending diet and physical activity \pm drugs in obesity Grade II (i.e., BMI $> 35-39.9$) and also diet and physical activity \pm drugs \pm surgery for obesity Grade III (i.e., BMI ≥ 40)

Table 2: Management guidelines for obesity based on BMI with waist circumference in adults

Variable	European Guidelines for Obesity Management in Adults		National Institute for Health and Care Excellence		
	Men <94 cm, women <80 cm	Men ≥94 cm, women ≥ 80 cm	Men <94 cm, women <80 cm	94–102 cm in men, 80–88 cm in women	>102 cm in men, >88 cm in women
Overweight or pre-obese state; BMI 25–29.9	**	**	*	**	**
Obesity Grade I; BMI 30.0–34.9	**	***	**	**	**
Obesity Grade II; BMI 35.0–39.9	***	***	***	***	***
Obesity Grade III; BMI ≥40	****	****	****	****	****

*General advice on healthy weight and diet, **diet and physical activity, ***diet and physical activity±drugs, ****diet and physical activity±drugs±surgery. BMI: Body mass index

Table 3: Guidelines for the lifestyle intervention in the management of obesity in adults

Interventions	AACE/ACE	NHMRC	European Guidelines for Obesity Management in Adults	National Institute for Health and Care Excellence
Diet plan	Mediterranean, DASH, low carbohydrate, low fat, volumetric, high protein, vegetarian	Wide variety of nutritious foods as recommended in the current Australian Dietary Guidelines [15]	Decrease energy density of food; increase vegetables and eat two portions of fruit per day; decrease fatty foods, especially saturated fat; decrease refined carbohydrates, sugar, and sweetened beverages	Consider low-calorie diets
Reduction in energy intake/day in kcal	500–750	600	-	600
Physical activity with time duration per week	Voluntary aerobic physical activity* performed on 3–5 separate days per week	Moderate-intensity activity* vigorous activity**	Aerobic exercises* and ordinary/daily physical activity	Moderate or greater intensity physical activity* on 5 or more days a week. The activity can be in one session or several sessions lasting 10 min or more
Strategies for behavioral change†	1–11	1,2,4,5,6,9	8,12	1,2,4,5,6,9,11,13,14,15,16

*~150 min/w, **75–150 min/w, DASH: Dietary approach to stop hypertension, †strategies for behavioral change. (1Self-monitoring, 2goal setting, 3education, 4problem-solving, 5stimulus control, 6behavioural contracting/behavior and progress, 7stress reduction, 8psychological support/evaluation, 9cognitive restructuring, 10motivational interviewing, 11mobilization of social support/slowing rate of eating ensuring social support, 12cognitive behavioral therapy, 13assertiveness, 14reinforcement of changes, 15relapse prevention, 16strategies for dealing with weight regain)

irrespective of the WC. Diet and physical activity were recommended for obesity Grade I (i.e., BMI >30.0–34.9) in the NICE guidelines irrespective of the WC. Although, diet and physical activity were recommended by European guidelines among the obesity Grade I with the normal WC (men <94 cm and women <80 cm), drug therapy is recommended along with the diet and physical activity in the increasing WC (Table 2).

Guidelines for the lifestyle intervention in the management of obesity in adults

The guidelines included in the review generally recommending diet, physical activity, and behavioral change under lifestyle intervention (Table 3).

Diet

Reduction in calorie [13], carbohydrate [11,12], and fat [11] diet generally recommended and encouraged to take more vegetables, fruits, and protein [11,12] and the NHMRC recommends to follow the Australian Dietary Guidelines [16] also substantiates the other guidelines. However, the Mediterranean and Dietary Approaches to Stop Hypertension (DASH) emphasized by the AACE/ACE [11]. Reduction in weight intake/day ranges from 500 to 750 kcal according to the AACE/ACE [11] and 600 according to the NHMRC [14] and NICE guidelines [13].

Physical activity

Aerobic exercise and moderate to greater/vigorous physical activity are recommended for approximately ~150 min/w in the management

of overweight/obesity [11-14]. In addition, European guidelines recommended physical activity daily [12].

Behavioral change

The recommendation regarding the behavioral change (Table 3) includes the self-monitoring, goal setting, education, problem-solving, stimulus control, behavioral contracting/behavior and progress, stress reduction, psychological support/evaluation, cognitive restructuring, motivational interviewing, mobilization of social support/slowing rate of eating ensuring social support, cognitive behavioral therapy, assertiveness, reinforcement of changes, relapse prevention, and strategies for dealing with weight regain [11-14].

Guidelines for the pharmacological intervention in the management of obesity in adults

Orlistat is the only medication recommended unanimously [11-14]; however, liraglutide [11,12], phentermine/topiramate extended release (ER) [11], and bupropion/naltrexone [12] were the other choices for the management of overweight/obesity in the adults (Table 4).

DISCUSSION

Overweight/obesity is the known risk factor for diabetes [17,18], hypertension [17,19], dyslipidemia [20], cardiovascular diseases (CVDs) [21,22], stroke [23], asthma [24,25], gastroesophageal reflux disease [26], cancer [27], and osteoarthritis [28], especially in the

Table 4: Guidelines for the pharmacological intervention in the management of obesity in adults

Interventions	AACE/ACE*	NHMRC**	European Guidelines for Obesity Management in Adults***	National Institute for Health and Care Excellence****
Pharmacologic therapy	Orlistat Phentermin /topiramate ER Liraglutide	Orlistat	Orlistat Bupropion/naltrexone Liraglutide	Orlistat

*Preferred weight loss medication: Individualization therapy, **treating overweight (with comorbidities) and obesity that has been evaluated for long-term safety, ***pharmacotherapy can help patients to maintain compliance, ameliorate obesity-related health risks and improve quality of life, ****anti-obesity drugs are suitable for patients with BMI >30 kg/m² or with BMI >27 kg/m² with comorbidities. BMI: Body mass index, ER: Extended release

adults, it decreases the life span from 5.8 and 7.1 years compared with the non-obese population [29]. Hence forth, the amendment of clinical practice guidelines needs to be ensured to minimize the morbidity and mortality in this regard. Lifestyle modifications including diet, physical activity, and behavioral changes were highly recommended for BMI >25 [11,14] with especially WC ≥94 cm in male and ≥80 cm in the female [12,13]. Recent findings advocating that both BMI and WC should be considered for monitoring obesity, especially in hypertensive [30,31], however, WC is the significant predictor for type-2 diabetes mellitus [32-34] than the other anthropometric measurement. On the other hand, controversy findings have been reported about the association of cardiometabolic markers with the anthropometric measurements by establishing its association with the WC alone in Canadian adults [35] and both BMI and WC in Chinese adults [36]. However, the criteria to determine the metabolic syndrome by both the International Diabetes Federation [37] and the National Cholesterol Education Program [38] are consistent with both BMI and WC about the anthropometric measurements concerning obesity. In this regard, various research findings were established recently about diet, physical activity, behavioral intervention, and drug therapy.

Diet

The recent studies encourage the intake of Mediterranean diet [39,40] and DASH as part of obesity management [41] dietary approaches to the treatment of obesity [42] and also mindful eating intervention [43] has already been established. Reduction in energy intake/day in kcal is highly encouraged by the clinical practice guidelines for obese adults [11,13,14]. However, the recent guidelines encouraging a very low-calorie diet as a part of a multicomponent weight management strategy, for people who are obese and who have a clinically assessed need to rapidly lose weight [13]. Energy deficit is the primary challenge during this intervention [44] which can be minimized by optimizing the diet according to the individuals [45] with the careful consideration of target risk factors [44]. Moreover, this type of intervention encourages the patient to tailor and personalize their dietary patterns to reduce energy intake for sustainable weight loss [46].

Physical activity

Physical activity with dietary intervention is highly effective in weight loss [47,48], especially to minimize the CVD risk factors [49-51]. Approximately 150 min/w physical activity is recommended by all the clinical practice guidelines included in this review [11-14]. The vigorous activity needs 75-150 min/w [14] is recommended to implement gradually with the initial 4-12 w of moderate-intensity activity if an individual with a BMI <35 [52]. Evidence that suggests total daily accumulated energy expenditure is the strongest predictor of weight loss in obesity [53,54]. Cardiorespiratory fitness emphasizing the reduction in the mortality among the obese population with the independent cardiometabolic risk factors including fat deposition [55-57], blood pressure [58,59], and glycemic control [59,60]. Various strategies have been explored recently including moderate-to-vigorous-intensity physical activity [61-63], comprehensive behavioral intervention including 10,000 steps/d [64], wearable devices in the comprehensive weight loss intervention [65,66], and comprehensive weight loss intervention through a telephone call with a health coach [67,68]. Based on the above findings, the time duration, frequency, and type of exercise need to individualize by considering the BMI/WC and other risk factors in the individual.

Behavioral interventions

Self-monitoring, goal setting, problem-solving, stimulus control, behavioral contracting/behavior and progress, and cognitive restructuring are common behavioral interventions recommended by the clinical practice guidelines (Table 3) [11,13,14]. Behavioral intervention through counseling promotes the dietary habit and physical activity among the adults irrespective of the cardiac risk factors [69-71]. However, the most recent randomized controlled trial found no significant changes in BMI using low-intensity weight loss programs and also recommended an incremental dose in the intervention [72]. Digital-based approach including health behavior change interventions [73] offers specifically the behavior change techniques [74] and modes of delivery may individualize the need for behavioral changes [75,76]. This is further needed to be standardized with the relevant intervention components in promoting chronic weight management [77-79].

Drug therapy

Orlistat, lorcaserin, phentermine/topiramate ER, naltrexone/bupropion, and liraglutide 3 mg are already approved by the FDA [80,81]. Drug therapy in the management of obesity associated with modest weight benefits (5-10% range) with a significant impact on cardiovascular risk [82]. However, drug therapy can be considered as an alternative in such cases neither achieved weight loss with diet and physical activity nor eligible for bariatric surgery. The best approach is to individualizing drugs with specific lifestyle interventions [83] and/or behavioral intervention [82] according to the obese adult. Anti-obesity drugs aimed at limited energy absorption by inhibiting and blocking gastric and pancreatic lipases or amylases, microsomal triglyceride in protein, diacylglycerol-O-acetyltransferase/monoglycerol-O-acyltransferase, and low-affinity sodium-dependent glucose cotransporter-2 (SGLT2) [84-86]. The emerging drugs under investigation including cetilistat (a lipase inhibitor), dapagliflozin (an SGLT2 inhibitor), empagliflozin (an SGLT2 inhibitor), and dirlotapide (an MTP inhibitor) belong to this group appearing as potential drugs by reducing absorption [87].

Surgical intervention

Surgical intervention may be considered if BMI >40 [12-14] or ≥35 [11]; however, the criteria are >30 if already made multiple attempts on weight reduction [88]. In addition, BMI >35 associated with the comorbid conditions indicated for bariatric surgery [89]. Significant reduction in mortality from 30% to 50% due to CVD deaths [90] is achieved with the bariatric surgery as compared to lifestyle intervention [91]. However, perioperative mortality (<0.3%) risk is associated with bariatric surgery [92] and the incidence rate is depending on the follow-up, complications, bariatric procedure, individual patient characteristics, etc. [93]. Henceforth, still more research is warranted to examine the long-term outcomes of bariatric surgery in the heterogeneous population [94-98].

CONCLUSION

The selection of anthropometric measurements to determine obesity plays a crucial role initially in the management of obesity since controversy findings reported in this regard. A combination of both the BMI and WC offers additional benefits to classify overweight/obesity; still, ethnicity-based classification is warranted to establish the same. Although obesity has several management options, this should be

optimized according to the patient. The clinician should consider the comorbidities/family history with any metabolic risk factors among the adult population for the prevention of cardiovascular disorder and other complications due to obesity.

AUTHOR'S CONTRIBUTIONS

The author declares that this entire work was done by the author named in this article.

CONFLICTS OF INTEREST

The author declares no conflicts of interest.

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