REVIEW OF LITERATURE

1. Overweight and Obesity
   (a) Current global situation and trends
   (b) Prevalence
   (c) Health Hazards

2. Strategies for weight management
   (a) Dietary management and Exercise
   (b) Behavior and life style change
   (c) Nutrition education and counseling
A comprehensive knowledge of the related literature not only helps the investigator to define the frontiers of the field but also helps in avoiding the unintentional replication of the previous work done. Therefore an extensive review of literature is must in any research endeavor to define the goals and interpretation of the significance of result.

The review of the literature leads to significant improvement of research design and assists up in delimiting our research problems. In this chapter, relevant literature having direct or indirect bearing on the present exploratory research on “Assessment of weight reduction in overweight adult people with a combination treatment of electronic devices, diet and physical exercise “has been review and organized under the following sections:-

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   (a) Current global situation and trends

   (b) Prevalence

   (c) Health Hazards

2. Strategies for weight management

   (a) Dietary management and Exercise

   (b) Behavior and life style change

   (c) Nutrition education and counseling
1. OVERWEIGHT AND OBESITY

(a) Current global situation and trends

Overweight is generally defined as having more body fat than is optimally healthy. Being overweight is a common condition, especially where food supplies are plentiful and lifestyles are sedentary. Overweight is defined as a BMI of between 25 -30kg/m².

Excess weight has reached epidemic proportions globally, with more than 1 billion adults being either overweight or obese. Increases have been observed across all age groups.

A healthy body requires a minimum amount of fat for the proper functioning of the hormonal, reproductive, and immune systems, as thermal insulation, as shock absorption for sensitive areas, and as energy for future use. But the accumulation of too much storage fat can impair movement and flexibility, and can alter the appearance of the body.

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have a negative effect on health, leading to reduced life expectancy and/or increased health problems. People are considered obese when their body mass index (BMI), a measurement obtained by dividing a person's weight by the square of the person's height, exceeds 30 kg/m².

New concept for assessing abdominal obesity is only waist measurements but still WHR is frequently used. There are several latest studies in which WHR is used as a parameter for measuring obesity.

The degree to which a person is overweight is generally described by body mass index (BMI). Overweight is defined as a BMI of 25 or more, thus it includes pre-obesity defined as a BMI between 25 and 30 and obesity as defined by a BMI of 30 or more. Pre obese and overweight however are often used interchangeably thus giving overweight a common definition of a BMI of between 25 -30. There are however several other common ways to measure the amount of adiposity or fat present in an individual's body.
The graded classification of overweight and obesity is valuable. It permits meaningful comparisons of weight status within and between populations. It makes possible to identify individual and group at increased of morbidity and mortality.

The most widely used classification on the basis of BMI categories (Garrow, 1996) is BMI :- 18.5-24.9 is Normal Range, 25-29.9 is Grade I overweight, 30-39.9 is Grade II overweight, >40 is Grade III overweight.

A García-Hermoso et al. (2017) studied the evidence of the effects of reallocating time spent in sedentary behaviours in different activity intensities on youth's adiposity. Five databases were searched. Studies that reported the effects of replacing sedentary behaviour with light-intensity physical activity (LIPA) and/or moderate-to-vigorous physical activity (MVPA) on at least one adiposity parameter. The estimated regression coefficients (β) and 95% CIs were combined and meta-analysed. Data from 7,351 youths and five studies were analysed. Pooled analysis from cross-sectional studies shows that replacing sedentary time with LIPA showed no significant associations with any adiposity-related outcomes. Replacing sedentary time with MVPA was statistically associated with total body fat percentage (β = -2.512; p = 0.003), but not with body mass index or waist circumference. In subgroup analysis, the greatest magnitude of association was observed from studies where 60 min of sedentary behaviour was reallocated to 60 min of MVPA (β = -4.535; p < 0.001). Our results highlight the importance of promoting MVPA, which may improve body composition phenotypes in young people. This information can be used to develop more effective lifestyle interventions.

NCD Risk Factor Collaboration (2016) a large network of scientists from around the world have examined the trends of adult Body Mass Index (BMI) in 200 countries. They found that globally the number of obese individuals has increased from 105 million to 641 million in the last 40 years. The world has transitioned to more obese than underweight people, with the exception of some
sub-Saharan and Asian regions. The research network, the NCD Risk Factor Collaboration, led by a group from Imperial College London, collected BMI data from almost 19.2 million men and women. BMI is a widely used indicator of body fatness, calculated by taking into account a person’s height and weight*. High values of BMI are associated with an increased risk of developing cardiovascular disease, diabetes, musculoskeletal disorders and some types of cancer. However, low values of BMI can have negative effects on health. Results showed that between 1974 and 2014, the average BMI shifted from 21.7 to 24.2 in men, and from 22.1 to 24.4 in women, corresponding to the “world’s population having become on average more than 1.5 kg heavier each decade”. Men in high-income, English speaking countries, and women in Latin America had the most marked increase in BMI per decade, whereas women in southern and central Europe and high income Asia-Pacific had the smallest increases.

R L Williams et al. (2015) evaluated effective strategies are required to reduce the prevalence of overweight and obesity; however, the effectiveness of current weight loss programmes is variable. A total of 58 studies met the eligibility criteria with 49 studies of higher quality included in the final data synthesis. Eleven studies that directly compared weight loss in men and women reported a significant sex difference. Ten of these reported that men lost more weight than women; however, women also lost a significant amount of weight. Analysis of effect sizes found small differences in weight loss favouring men for both diet ($g = 0.489$) and diet plus exercise ($g = 0.240$) interventions. There is little evidence from this review to indicate that men and women should adopt different weight loss strategies. Current evidence supports moderate energy restriction in combination with exercise for weight loss in both men and women.

Fraser1 et al. (2014) studied Class II and III obesity (BMI >35 kg·m2) have increased dramatically in recent years. Current clinical guidelines suggest diet and exercise as first line treatment for adults throughout the spectrum of overweight and obesity. However, to date there is no systematic review that examines the effects of diet and exercise on this high risk population. This systematic review
will examine the combined effects of diet versus diet and exercise on body composition in severe obesity. Medline and Cinahl were searched for randomised controlled trials comparing diet and exercise to diet alone. Studies published until July 2013 were included if they used reliable methods for analysing body composition in adults with BMI \( \geq 35 \text{ kg} \cdot \text{m}^2 \). Five of 459 studies met the inclusion criteria. Two studies, both in older adults, reported that exercise reduced lean mass loss during weight loss. Two studies showed that exercise facilitated (greater) fat mass loss. The remaining study reported no differences in body composition when exercise is added to energy restriction. Exercise training during energy restriction for individuals with BMI \( \geq 35 \text{ kg} \cdot \text{m}^2 \) may influence body composition outcomes but the evidence is limited. Further studies should focus on the efficacy of different exercise protocols during energy restriction for this population in order to better inform decision making for the treatment of severe obesity in respect to favourable body composition outcomes.

**According to Global Burden of Disease Study (2013) published in The Lancet.** Worldwide, there has been a startling increase in rates of obesity and overweight in both adults (28% increase) and children (up by 47%) in the past 33 years, with the number of overweight and obese people rising from 857 million in 1980 to 2.1 billion in 2013, according to a major new analysis. However, the rates vary widely throughout the world with more than half of the world’s 671 million obese individuals living in just ten countries—the USA, China and India, Russia, Brazil, Mexico, Egypt, Germany, Pakistan, and Indonesia.

**Ian Brown and Jill Gould (2013)** studied developing interest in qualitative research to understand the perspectives and experiences of people living with obesity. However, obesity is a stigmatized condition associated with negative stereotypes. Social contexts emphasizing large body size as a problem, including research interviews, may amplify obesity stigma. This study reviews the methodology employed by qualitative studies in which study participants were obese and data collection involved face-to-face interviews. Database searches identified qualitative studies meeting inclusion criteria from 1995 to 2012.
Following screening and appraisal data were systematically extracted and analyzed from 31 studies. The studies included 1206 participants with a mean age of 44 years and mean BMI of 37 kg/m². Women (78.8%) outnumbered men (21.2%) by four to one. Socio-economic background was not consistently reported. The studies employed similar, typically pragmatic, qualitative methodologies, providing rich textual data on the experience of obesity derived from face-to-face interviews. The majority considered quality issues in data collection, analyses and generalize ability of findings. However, the studies were weak as regards researcher reflexivity in relation to interviewer characteristics and obesity stigma. Impact of obesity stigma has not been attended to in the qualitative research. Clear information about study participants is essential, but studies involving face-to-face interviews should also report on interviewer characteristics including body size.

**Vasanti S. Malik et al. (2013)** the worldwide increase in obesity and related chronic diseases has largely been driven by global trade liberalization, economic growth and rapid urbanization. These factors continue to fuel dramatic changes in living environments, diets and lifestyles in ways that promote positive energy balance. Nutritional transitions in low-income and middle-income countries are typically characterized by increases in the consumption of animal fat and protein, refined grains, and added sugar. This change is coupled with reductions in physical activity owing to more mechanized and technologically driven lifestyles. Owing to the scope and complexity of the obesity epidemic, prevention strategies and policies across multiple levels are needed in order to have a measurable effect. Changes should include high-level global policies from the international community and coordinated efforts by governments, organizations, communities and individuals to positively influence behavioural change.

**Gurpreet Kaur et al. (2012)** assessed changes in anthropometry and body composition among occupationally sedentary adult women with progression of age. A cross-sectional study was conducted on 152 occupationally sedentary adult women comprising of students, research fellows, assistant professors, associate
professors and professors from Punjab Agricultural University, Ludhiana. The subjects were divided into four age groups i.e. 21-30, 31-40, 41-50 and 51-60 years to assess changes in anthropometry and body composition with progression of age. Basic anthropometric measurements such as height, waist and hip circumference measurements were taken using standard methods. Weight and Body composition of the subjects was determined using bioelectrical impedance. A gradual increase (p≤0.05) in anthropometric and body composition parameters such as weight, waist circumference, hip circumference, body mass index, fat mass and visceral fat rating was observed with the advancement of age. The lean body mass decreased significantly (p≤0.01) as the age progressed, the values for four age groups being 74.9, 68.9, 62.8 and 60.9 %, respectively. Contrary to this, fat mass increased with age, the corresponding values for four age groups being 15.7, 21.4, 26.6 and 29.2 kg, respectively.

Kavita Vasudevan et al. (2012) studied Facility based cross-sectional study. Using a pre-tested semi-structured questionnaire all subjects were interviewed after taking informed consent. Weight, height, waist circumference and hip circumference were measured. Overweight, obesity and central obesity was estimated by using standard criteria. Prevalence of overweight or obese was 26.7 % & 35.2% resp. using the standards for Asian Indians and 29.1% and 3.8% resp. using the WHO cut-offs. About 23.3 5%and 10.9% of the subjects had larger waist circumferences and higher waist-hip ratios The prevalence was significantly more in males when compared to females. Overweight and obesity is a problem in this study group which calls for primary preventive measures like health education, dietary modification, physical activity and periodic screening.

Goyal et al. (2011) also used waist hip ratio (WHR) for assessing central obesity. A total of 541 Punjabis were selected in a study. Results revealed that an overall prevalence of central obesity by WHR was observed to be 41.4% and was significantly higher among females (64.4%) than males (17.1%).
Zatonska et al., (2011) determined the prevalence of obesity in the population of Swietokrzyskie Province in Poland. Height, weight, body mass index (BMI) and waist to hip ratio (WHR) of 2567 females and 1287 males were measured. Findings of the study revealed that overall prevalence of obesity was 35%. Analysis of WHR showed abdominal obesity in 64% of males and 79% of females.

Marrodan et al. (2007) while studying 105 individuals of both sexes, aged 17-32 years. The study was conducted to compare anthropometry and bioelectrical impedance analysis for body composition assessment. The agreement between body composition parameters obtained through anthropometry and bioelectrical impedance indicated that bioimpedance analysis is acceptable for use in epidemiological studies of nutritional status assessment.

Mansour et al (2007) identified cut-offs for BMI and upper body adiposity waist circumference (WC), waist to hip ratio (WHpR) and waist to height ratio (WHtR) that associated with increased risk of type 2 diabetes mellitus and hypertension in Iraqi adults. Total number of persons involved was 12,986, aged 45.6±15.7 years. The cut-off point in men associated with increased risk of type 2 DM and hypertension were BMI 25.4 and 24.9, WC 90 and 95 cm, WHpR 0.92 for both and WHtR 0.52 and 0.55, respectively. For women, the cut-off point associated with increased risk of type 2 DM and hypertension were BMI 26.1 and 26.5, WC 91 and 95 cm, WHpR 0.91 for both and for WHt R.56 and 0.59, respectively. The best index for association with type 2 DM was WHpR with cut-off point of 0.92 for men and 0.91 for women. For hypertension, best index is WHtR with cut-off points of 0.55 for men and 0.59 for women.

Bahadori et al. (2006) measured the levels of FFM and BF in 153 healthy Caucasian men and 451 healthy Caucasian women between the ages of 18 to 80 years, using multi-frequency bioelectrical impedance analysis. Fat free mass index (FFMI), body fat mass index (BFMI), and %BF were then calculated for each subject and observed that predicted FFMI values were 18.1 to 21.7 kg/m2 for
men and 15.1 to 17 kg/m² for women within the normal BMI ranges (18.5-24.9 kg/m²). Predicted BFMI values were 1.5 to 5.0 kg/m² for men and 3.4 to 8.0 kg/m² for women within the normal BMI ranges. BFMI values were above 8.0 and 11.7 kg/m² in men and women, respectively, for obese BMI (>30 kg/m²). Normal ranges for %BF were 11.9 to 22.7 and 20.8 to 31.0 for men and women, respectively.

**Eran et al. (2006)** conducted a study to analyze the relationship between BMI and risk of pre-hypertension in Irracli population (m = 560, 588). The significant increase in the mean systolic and diastolic blood pressure with increased BMI. It was concluded that the prevalence of pre-hypertension was significantly higher in obese subjects.

**(b) Prevalence**

**N Dhanda and S Taheri (2017)** studied co morbidities related to obesity are already extensive, but as the prevalence of obesity increases globally, so do the number of its associated conditions. The relationship between hearing impairment and obesity is a relatively recent research interest, but is significant as both conditions have the ability to substantially reduce an individual’s quality of life both physically and psychologically. Obesity has a significant effect on vascular function, and this may have an impact on highly vascular organs such as the auditory system. This review aims to provide an overview of the existing literature surrounding the association between hearing loss and obesity, in order to emphasise these two highly prevalent conditions, and to identify areas of further investigation. Our literature search identified a total of 298 articles with 11 articles of relevance to the review. The existing literature in this area is sparse, with interest ranging from obesity and its links to age-related hearing impairment (ARHI) and sudden sensorineural hearing loss (SSNHL), to animal models and genetic syndromes that incorporate both disorders. A key hypothesis for the underlying mechanism for the relationship between obesity and hearing loss is that of vasoconstriction in the inner ear, whereby strain on the capillary walls due
to excess adipose tissue causes damage to the delicate inner ear system. The identified articles in this review have not established a causal relationship between obesity and hearing impairment. Further research is required to examine the emerging association between obesity and hearing impairment, and identify its potential underlying mechanisms.

**Ofori-Asenso R *et al.* (2016)** studied in many low and middle income countries (LMICs), the distribution of adulthood nutritional imbalance is shifting from a predominance of under nutrition to over nutrition. The objective of this study was to systematically review the literature towards providing an estimate of the prevalence of overweight and obesity among adult Ghanaians. This retrieved studies (published up to 31st March 2016) that reported overweight and obesity prevalence among Ghanaians. All online searches were supplemented by reference screening of retrieved papers to identify additional studies. Forty-three (43) studies involving a total population of 48,966 sampled across all the ten (10) regions of Ghana were selected for the review. Our analysis indicates that nearly 43% of Ghanaian adults are either overweight or obese.

**Oyun Chimeddamba et al. (2016)** to analyzed trends in the prevalence of overweight and obesity among Mongolian adults during the past decade as measured by body mass index (BMI) and waist circumference (WC). Data from the repeated cross-sectional surveys on the prevalence of non communicable disease risk factors conducted in 2005, 2009, and 2013 in Mongolia were used. Linear regression was used to quantify trends in mean BMI and WC, adjusted for age group, sex, and survey year. The age-standardized prevalence of obesity, denoted by the international BMI cutoff values, in men and women between 2005 and 2013 increased from 10.8% to 17.6% and from 18.9% to 26.4%, respectively. Using Asian-specific BMI cutoff values for men and women, the age-standardized prevalence of obesity between 2005 and 2013 increased from 20.0% to 32.8% and 33.4% to 43.7%, respectively. These data demonstrate the urgent need for obesity treatment, prevention, and monitoring in Mongolia.
Brian T Power et al. (2014) conducted a systematic review to examine the effectiveness of workplace-based diet and/or physical activity interventions aimed at healthcare professionals and to identify and describe key components of effective interventions. Seven electronic databases were systematically searched. Thirteen randomised controlled trials met the inclusion criteria, of which seven had data available for meta-analysis. Where meta-analysis was possible, studies were grouped according to length of follow-up (<12 months and ≥12 months) and behavioural target (diet only, physical activity only or diet and physical activity), with outcome data pooled using a weighted random effects model. Nine studies reported statistically significant (between-group) differences. Four studies reported being informed by a behaviour change theory. Meta-analysis of all trials reporting weight data demonstrated healthcare professionals allocated to dietary and physical activity interventions lost significantly more body weight (−3.95 Kg, [95% CI −4.96 to −2.95 Kg]) than controls up to 12 months follow up.

Jin-Won Noh et al. (2014) examined the correlation between being overweight and some key variables, such as demographics, socioeconomic status, general health status, and health behavior in a large sample of older individuals, by each gender. We used data from the 2008 Korean Longitudinal Study of Aging and it included 8,157 participants who were 45 years or older. To understand the relationship between the overweight participants in accordance to demographic and socioeconomic characteristics, health status, and health behaviors, a weighted chi-square test and logistic regression analysis were conducted by separating variables related to overweight, according to the genders. The number of people in the normal group was 6,347 (77.8%), while the people who were considered overweight were 1,810 (22.2%). Women (n=4,583) constituted 52.7% of the subject, 24.9% of whom were classified as overweight. Meanwhile, 20.6% of the 47.3% (n=3,574) of the sample who were men were classified as overweight. Participants between the ages of 45 and 64 with chronic diseases were more likely to be overweight. Men in the 4th quartile of household income were more likely to be overweight than those who were in the 1st quartile, in contrast, while
unemployed women with lower education levels and urban residents were at greater risk for being overweight. These findings appear to support the association of gender-specifics with the prevalence of being overweight.

Ijezie Chukwuonye et al. (2013) Studied obesity is a major health problem, and there is an increasing trend of overweight and obese individuals in developing countries. A systematic review of papers published on the prevalence of obesity among adults in the country was carried out. We covered work published in MEDLINE, PubMed, Google, and African Journals Online using the terms "prevalence of overweight and obesity in Nigeria" or "overweight and obesity in Nigeria." In addition, personal inquiries were made. The search limits were articles published from January 2001 to September 2012. Only studies that used the body mass index to assess for overweight and obesity were included. Four studies met the inclusion criteria out of the 75 studies reviewed. In Nigeria, the prevalence of overweight individuals ranged from 20.3%–35.1%, while the prevalence of obesity ranged from 8.1%–22.2%.

Kokila Selvaraj and P.Sivaprakasam (2013) studied the prevalence of overweight and obesity among the students of Meenakshi medical college hospital and research institute, Kanchipuram district, Tamil Nadu. It is a cross sectional study where 458 students were included. The study involved administration of pretested questionnaire, measurements of anthropometry and waist circumference and also recording of blood pressure. Out of 500 students, 458 (92%) participated in the study. Among them 54% were males and 46% were females. The prevalence of overweight was 24.3% and the prevalence of obesity was 8.6% according to WHO guidelines. Overweight and obese individuals are spending more time on sedentary life style. The prevalence of high systolic and diastolic blood pressure was significant among over weight and obese individuals. This study shows a high prevalence of obesity and overweight among medical students. Sedentary life style and frequency of eating fatty food was high among over weight and obese individuals. Prevalence of diastolic and systolic blood pressure is significantly high among overweight and obese individuals. This study itself
created awareness about their weight and promote physical activity among many students.

**Sanggon Nam (2013)** studied Obesity is one of the most serious health problems in the world today. Asian Americans are usually less overweight and obese than African Americans and Hispanic Americans, but the rate of obesity in Asian Americans is still increasing, especially in younger generations. This research examines Asian American obesity using existing research, as a means of finding the need for greater emphasis on Asian American obesity intervention research. A systematic review is done in order to find Asian American obesity research, due to the minimal amount of existing studies. In total, there were only nine papers which were not duplicates and which still met the criteria for inclusion, from an initial 106 papers. There is very little research on obesity in Asian Americans. Although the rate of obesity among Asian Americans is increasing, there are few related articles, projects, and surveys, and there is little information. Based on this literature review, it is concluded that there is a shortage of Asian American obesity research, even though there is an evident need for particular obesity intervention programs that target Asian Americans.

**Parekh Alok et al. (2012)** studied prevalence of overweight and obesity among urban & rural adolescents in Surat (Gujarat, India). The data were derived from cross-sectional sampling of children, 176 in rural and 213 in urban, aged 14–16 years doing study in government schools in year of 2009. Age, gender and body mass index (BMI) were used to define overweight and obesity. The prevalence of obesity increased significantly from 12.8% in rural to 14.6% in urban (p<0.01), whereas underweight decreased from 13.6% to 4.6% (p<0.001). There was a significantly higher risk of being overweight and obese in urban than rural, after adjusting for age, gender. Urban Males had significantly higher increase in prevalence and risk of being overweight and obese. This study showed an increasing in prevalence of overweight and obesity in urban adolescents especially with male gender, calling for an urgent need for immediate and targeted preventive measures.
Kushwaha et al. (2011) determined the prevalence of obesity among adults women residing in Farrukhabad District, Uttar Pradesh and also studied the factors associated with obesity among these 744 women (20-45 years). Findings of the study revealed that overall prevalence of obesity was 27% in the study population and a significant association was found between higher dietary intake and low physical activity with obesity.

J Baalwa et al. (2010) determined the prevalence of overweight and obesity in young adults in urban (Kampala city) and rural areas (Kamuli District) of Uganda. Cross-sectional survey of 683 randomly selected young adults aged 18–30 years. Obesity was defined as body mass index (BMI) > 30 kg/m$^2$ and overweight as BMI > 25 kg/m$^2$. Distribution of BMI by socio-demographic characteristics was determined. Of the 683 participants, 50.5% were female and 53.2% were from Kampala. The overall prevalence of obesity and overweight was 2.3% and 10.4%, respectively. The prevalence of obesity was 4.4% in Kampala and 0% in Kamuli while the prevalence of overweight was 10.2% and 10.6% in Kampala and Kamuli, respectively. Compared to males, females were more likely to be obese (2.9% vs. 1.8%) or overweight (17.4% vs. 3.3%). Residing in the city, alcohol consumption, smoking, non-engagement in sports activities, commuting to school by taxi or private vehicle and being from a rich family were the main factors significantly associated ($P<0.05$) with obesity. Being female ($p = 0.0001$) and not engaging in any sports activities ($P = 0.002$) were two factors significantly associated with being overweight.

In many countries like China, Thailand and Singapore, nutrition transition which is associated with a change structure of the diet, reduced physical activity has resulted in rapid increase in the prevalence of obesity in their inhabitants (Kumar and Singh, 2009).

National Nutrition Surveillance Centre (2009) the National Nutrition Surveillance Centre, in partnership with the Health Service Executive (HSE), as part of the HSE Framework for Action on Obesity conducted a review relating to
this area. The aim of this literature review was to explore key findings from national and international research relating to obesity, and the interrelationship between obesity, physical activity and nutrition and other determinates. Combined diet and regular exercise does appear to be the most effective therapy for weight loss and also weight loss maintenance. The synergistic relationship appears to be that weight loss through dietary restriction alone results in reduction in energy expenditure, while physical activity increases energy expenditure, and the combination of the two leads to reduction in body mass, without subsequent reduction in resting energy expenditure. Regular physical activity also appears to be critical specifically for the reduction of obesity related and other chronic diseases. More national and international research is required to determine the best strategies for obesity prevention and treatment. Widespread promotion of regular physical activity is essential not only for weight loss and maintenance, but for many aspects of health.

Sherina and Lekraj (2009) determined the prevalence of obesity among adult women residing in Selengar (Malaysia) and also studied the factors associated with obesity among 1032 (20-59) women. Findings of the study revealed that overall prevalence of obesity was 16.7% in the study population and a significant association was found between race, religion, school attendance, education and marital status with obesity. They reported that among Orang Asli, and Evrasiam there was a high prevalence followed by Malays, Indian and Chinese. In case of religion Sikhs had the highest prevalence of obesity followed by Muslims, Hindu, Christian and Buddhist, similarly those who had attend school were showing less prevalence (10%) as compared to those who had not attended (28.3%). Subjects with no formal education had a higher prevalence of obesity (28.8%) as compared to those with formal education. Unmarried subjects had a lower prevalence (6.9%) than married ones (18.6%).

A recent report of year 2008 by center of disease control and prevention (CDC), Only one state, colorado had prevalence of obesity equal to or greater then 30% and were located in the mid south-east region.
Tiwari and Sankhla (2007) conducted a study an one thousand girl (18-21 years) to assess the prevalence of obesity and over weight among them in Udaipur city. Author found that 5.6% and 4.4% of the subjects were overweight and obese respectively.

WHO (2006) reported that in India there are 2.40 per cent obese, 13.50 per cent pre-obese males and 6.10 per cent obese and 17.40 per cent pre-obese females. Joshi and Joshi also reported that obesity, as an emerging problem is a major chronic disorder affecting 20-40 per cent adults in India. Dhurandhar and Kulkarni found prevalence of obesity to be 9.4 per cent among men and 19.3 per cent among women in urban community of South Delhi. Zarger observed that among Kashmiri population the overall prevalence of obesity has been found to be 15.01 percent, the prevalence of obesity among males was 7.0 per cent and in females 23.69 per cent. Thus, obesity is a growing problem, more common in females and urban population. Also reported that the incidence of obesity has been found to be higher among females than males.

Malhotra (2005) conducted an extensive survey to find out which states of India had the highest prevalence of obesity. It was found that the prevalence was highest in Punjab 30.3% males, 37.5% females followed by Kerala 24.3% males 34% females and Goa 20.8% males and 27% females.

Peterson et al. (2005) studied the rise of global obesity is thought to be a by-product of environmental and behavioral changes linked to economic development, modernization, and urbanization. Paradoxically, obesity often coexists with a substantial level of malnutrition.

Sharda Sidhu et al. (2005) assessed prevalence of overweight and obesity during a community based epidemiological survey on a randomized sample of 1700 (900 urban and 800 rural) adult Punjabi females in the age group from 20-45 years. For the assessment of overweight and obesity, height and weight measurements were taken on each subject. The prevalence rate of malnutrition was calculated according to the critical limits of body mass index (BMI). The observations show
that the combined overall prevalence rate of overweight/obesity in the present study is 43.88% and 22.26%, respectively, for urban and rural females. The frequency of overweight and obesity is more among urban females than in their rural female counterparts.

(c) Health Hazards

Maximilian Tremmel et al. (2017) assessed the economic burden of obesity and to identify, measure and describe the different obesity-related diseases included in the selected studies. A systematic literature search of studies in the English language was carried out in Medline (PubMed) and Web of Science databases to select cost-of-illness studies calculating the cost of obesity in a study population aged ≥18 years with obesity, as defined by a body mass index of ≥30 kg/m2, for the whole selected country. The time frame for the analysis was January 2011 to September 2016. The included twenty three studies reported a substantial economic burden of obesity in both developed and developing countries. There was considerable heterogeneity in methodological approaches, target populations, study time frames, and perspectives. This prevents an informative comparison between most of the studies. Specifically, there was great variety in the included obesity-related diseases and complications among the studies. Conclusions: There is an urgent need for public health measures to prevent obesity in order to save societal resources. Moreover, international consensus is required on standardized methods to calculate the cost of obesity to improve homogeneity and comparability. This aspect should also be considered when including obesity-related diseases.

C Kalaivani Ashok and S Karunanidhi (2016) studied late adolescents are tomorrow's adult population; assessment of their nutritional status is, therefore, primary to the prevention of non communicable diseases. An ex post facto study using a cross-sectional survey design was employed to find out the prevalence of overweight and obesity among young female college students in Chennai. A total of 2765 female college students aged 17-21 from 10 women's colleges in Chennai
city were included in the study. Anthropometric assessments included body mass index (BMI) and body fat percent. Dietary intake was assessed using a three 24 h dietary recall. Socioeconomic status (SES) of the sample was assessed using the Kalliath SES inventory. Assessments of BMI indicated that only half the number of female college students (54.8%) had normal weight, while quite a few students were either overweight (13.2%) or obese (5.2%). More than a quarter of female college students were also underweight (26.9%). Mean energy intake of the students was (1828 kcal) lower than the Indian Council of Medical Research recommended values. The average intake of fruits, leafy vegetables, and other vegetables were dismally low. The findings reflect both a dual burden situation and an improper dietary pattern prevailing among the population of young female college students, necessitating the need for appropriate nutrition intervention.

Harish Ranjani et al. (2016) studied Childhood obesity is a known precursor to obesity and other non-communicable diseases (NCDs) in adulthood. However, the magnitude of the problem among children and adolescents in India is unclear due to paucity of well-conducted nationwide studies and lack of uniformity in the cut-points used to define childhood overweight and obesity. Hence an attempt was made to review the data on trends in childhood overweight and obesity reported from India during 1981 to 2013. Literature search was done in various scientific public domains from the last three decades using key words such as childhood and adolescent obesity, overweight, prevalence, trends, etc. Additional studies were also identified through cross-references and websites of official agencies. Prevalence data from 52 studies conducted in 16 of the 28 States in India were included in analysis. The median value for the combined prevalence of childhood and adolescent obesity showed that it was higher in north, compared to south India. The pooled data after 2010 estimated a combined prevalence of 19.3 per cent of childhood overweight and obesity which was a significant increase from the earlier prevalence of 16.3 per cent reported in 2001-2005. Our review shows that overweight and obesity rates in children and adolescents are increasing not just among the higher socio-economic groups but also in the lower income groups where underweight still remains a major concern.
Ping li et al. (2016) studied relationship between overweightness, obesity and arterial stiffness remains unclear. We performed a meta-analysis evaluating the impact of obesity/overweight ness on arterial stiffness in healthy subject. Literature searches were conducted using databases (eg, MEDLINE, EMBASE) and citations cross-referenced. Studies evaluating the relationship between obesity/overweight ness and cfPWV, baPWV, and AIx were systematically searched. A total of 10 studies (1,124 obese/overweight subjects, 1,884 controls) were included. Compared to controls, obese/overweight subjects showed a significantly higher cfPWV (SMD 0.50 m/s; 95%CI 0.15, 0.86; \( P = 0.005 \)), baPWV (SMD 0.41 m/s; 95% CI 0.08, 0.74; \( P = 0.014 \)), and AIx (SMD 1.02 ; 95%CI 0.16, 1.87; \( P < 0.0001 \)). When analyzing ‘high quality’ studies, the difference in arterial stiffness among obese/overweight subjects and controls remain (SMD 0.73 m/s; 95%CI 0.16, 1.30; \( P = 0.013 \)). Arterial stiffness, a recognized marker of cardiovascular risk, is increased in obese/overweight subjects without overt cardiovascular diseases.

Ying Gao et al. (2016) evaluated the urban-rural disparity of overweight/obesity and explore its potential trend with breast cancer among Chinese women. The prevalence of overweight/obesity for Chinese rural women (35.2%, 29.2% for overweight and 6.0% for obesity) was significantly higher than that for Chinese urban women (33.4%, 27.7% for overweight and 5.7% for obesity) (\( P < 0.001 \)). For either rural or urban women, the prevalence of overweight/obesity was highest in north region, followed by east region for rural women and north-east region for urban women. For rural women, higher prevalence of overweight/obesity was significantly positively associated with elder age, Han nationality, low level of education, no occupation, high family income, less number of family residents, insurance, and elder age at marriage. Similar positive associations were also found for urban women, except negative associations for high family income, less number of family residents, and elder age at marriage. A non-significant positive trend between overweight/obesity and breast cancer was found for rural but a significant positive trend for urban women. A total of 1210/762 participants were recruited from the Chinese National Breast Cancer Screening Program.
Zhou X. et al. (2016) compared the effect of obesity on the outcomes of PCNL in kidney stone treatment. Eligible studies were searched in PubMed, Web of Science, and Cochrane Library databases. Data were analyzed using RevMan statistical software, weighted mean differences, ORs, and 95% CIs were calculated. Seven studies involving 2,720 normal-weight, 1,686 obese, and 286 super-obese individuals were included in this meta-analysis. A pooled analysis of safety revealed that no obvious differences in terms of complication rates after treatment existed between obese and normal-weight individuals. A pooled analysis of effectiveness revealed that no obvious difference in terms of stone-free rate after treatment existed between obese and normal-weight individuals. Moreover, no obvious differences in terms of length of hospital stay after treatment existed between super-obese and normal-weight individuals (95% CI -0.15 to 0.37, \( p = 0.39 \)). Additionally, no obvious differences in terms of operation time existed between obese and normal-weight individuals (95% CI -3.36 to 1.17, \( p = 0.34 \)). However, the operation time was longer among super-obese individuals than among normal-weight individuals (95% CI -22.64 to -1.40, \( p = 0.03 \)), and the length of hospital stay was shorter among obese patients than among normal-weight patients (95% CI 0.04-0.34, \( p = 0.01 \)). No publication bias was observed in this work. Thus, PCNL is a safe and efficacious treatment for renal stones in patients of all sizes.

Franz MJ et al. (2015) evaluated the majority of people with type 2 diabetes are overweight or obese, and weight loss is a recommended treatment strategy. Inclusion criteria included randomized clinical trial implementing weight-loss interventions in overweight or obese adults with type 2 diabetes, minimum 12-month study duration, a 70% completion rate, and an HbA1c value reported at 12 months. Eleven trials (eight compared two weight-loss interventions and three compared a weight-loss intervention group with a usual care/control group) with 6,754 participants met study criteria. At 12 months, 17 study groups (8 categories of weight-loss intervention) reported weight loss <5% of initial weight (-3.2 kg [95% CI: -5.9, -0.6]). A meta-analysis of the weight-loss interventions reported
non significant beneficial effects on HbA1c, lipids, or blood pressure. Two study groups reported a weight loss of ≥5%: a Mediterranean-style diet implemented in newly diagnosed adults with type 2 diabetes and an intensive lifestyle intervention implemented in the Look AHEAD (Action for Health in Diabetes) trial. Both included regular physical activity and frequent contact with health professionals and reported significant beneficial effects on HbA1c, lipids, and blood pressure.

Ingrid Sørdal Følling et al. (2014) overweight, obesity and associated conditions are major public health concerns in Norway. The prevalence of overweight and obesity in the general population in Norway is increasing, but there are limited data on how the situation is in hospitals. This study aimed to find the prevalence of overweight and obesity, and explore the associations of overweight, obesity and its related medical conditions in an adult in-patient sample at specified somatic and psychiatric departments at St. Olavs Hospital, Trondheim. A total of 497 patients participated. The mean BMI for the total sample at screening was 25.4 kg/m². The prevalence of overweight and obesity was 45.1%. There was a higher association of overweight and obesity among patients aged 40–59 years (OR: 1.7) compared to those being younger. There was no significant difference between the somatic and the psychiatric samples. In the somatic sample overweight and obesity was associated with obesity-related conditions for both genders (OR: 2.0 and 2.1, respectively), when adjusted for age. The substantial prevalence of overweight and obese patients may pose a threat to future hospital services. To further address the burden of overweight and obesity in hospitals, we need more knowledge about consequences of length of stay, use of resources and overall cost.

N Lasikiewicz et al. (2014) evaluated the psychological outcomes of weight loss following participation in a behavioural and/or dietary weight loss intervention in overweight/obese populations. 36 Studies were selected for inclusion and were reviewed. Changes in self-esteem, depressive symptoms, body image and health related quality of life (HRQoL) were evaluated and discussed. Where possible, effect sizes to indicate the magnitude of change pre- to post- intervention were
calculated using Hedges’ g standardised mean difference. The results demonstrated consistent improvements in psychological outcomes concurrent with and sometimes without weight loss. Improvements in body image and HRQoL (especially vitality) were closely related to changes in weight. Calculated effect sizes varied considerably and reflected the heterogeneous nature of the studies included in the review. Although the quality of the studies reviewed was generally acceptable, only 9 out of 36 studies included a suita control/comparison group and the content, duration of intervention and measures used to assess psychological outcomes varied considerably. Further research is required to improve the quality of studies assessing the benefits of weight loss to fully elucidate the relationship between weight loss and psychological outcomes.

Awosan et al. (2013) conducted a study to assess the dietary pattern, lifestyle, nutrition status and prevalence of hypertension among traders in Sokoto, Nigeria. A cross sectional descriptive study was conducted among 390 traders selected by multistage sampling technique from November to December, 2012. Anthropometric and blood pressure measurements were done for the participants, together with questionnaire administration. High prevalence of unhealthy eating habits was recorded among the participants; 50.7% eat their largest meal at dinner, 49.9% eat snacks everyday, 66.7% eat fatty foods, 27.1% and 33.0% drink fruit juice and carbonated drinks, respectively thrice weekly or more, 56.0 and 58.8% eat fruits and vegetables, respectively less than thrice in a week or not at all. Also, 50.7% live a sedentary lifestyle, 5.2% currently smoke cigarette and 10.8% had consumed alcohol within the past 30 days. Similarly, the prevalence of overweight (28.9%), obesity (28.1%) and hypertension (29.1%) was high among the participants. This study demonstrated high prevalence of unhealthy eating habits and lifestyle; together with high prevalence of overweight, obesity and hypertension among traders in Sokoto.

Yanhong Gong et al. (2013) evaluated depression and obesity (BMI ≥ 30) have been recognized as major public health issues worldwide. Although they have traditionally been compartmentalized as separate physical and emotional health
conditions, evidence has suggested interactions and common pathways between them, implying that they probably shared common underlying biological mechanisms. By a systematic review of the literature and knowledge mining, we explore a potential biological mechanism of obesity effects on depression. Bioactivators in the body of obesity including adiponectin, leptin and its receptors, ghrelin, endocannabinoids and orexin receptors may contribute to depression by the hypothalamic pituitary adrenal axis, psycho-neuro-immunological system, neurovegetative system and brain areas control of mood and emotion such as hippocampus, cortex and amygdala.

Dariush Mozaffarian et al. (2011) evaluated performed prospective investigations involving three separate cohorts that included 120,877 U.S. women and men who were free of chronic diseases and not obese at baseline, with follow-up periods from 1986 to 2006, 1991 to 2003, and 1986 to 2006. The relationships between changes in lifestyle factors and weight change were evaluated at 4-year intervals, with multivariable adjustments made for age, baseline body-mass index for each period, and all lifestyle factors simultaneously. Cohort-specific and sex-specific results were similar and were pooled with the use of an inverse-variance-weighted meta-analysis. Within each 4-year period, participants gained an average of 3.35 lb (5th to 95th percentile, −4.1 to 12.4). Aggregate dietary changes were associated with substantial differences in weight change (3.93 lb across quintiles of dietary change). Other lifestyle factors were also independently associated with weight change (P<0.001), including physical activity (−1.76 lb across quintiles); alcohol use (0.41 lb per drink per day), smoking (new quitters, 5.17 lb; former smokers, 0.14 lb), sleep (more weight gain with <6 or >8 hours of sleep), and television watching (0.31 lb per hour per day). Specific dietary and lifestyle factors are independently associated with long-term weight gain, with a substantial aggregate effect and implications for strategies to prevent obesity.

Jayashree Sachin Gothankar (2011) evaluated association of obesity with common co morbidities like hypertension and type 2 diabetes mellitus. A cross sectional study done on 53 adult subjects attending diabetes and hypertension
detection camp organized at an urban health training center of a private Medical College, Pune. Prevalence of obesity was 43% among adults. There was statistically significant association between BMI (>=25) and diabetes (p<0.05) and BMI and hypertension (p<0.05). In females central obesity (waist circumference >=80) was statistically associated with diabetes and hypertension. Diabetes and hypertension did not found to be associated with central obesity in male (p>0.05). Obesity as assessed by BMI and waist circumference is associated with hypertension & diabetes. Thus approaches to reduce the risk of developing hypertension and diabetes may include prevention of overweight and obesity.

Chad M Kerksick et al. (2010) investigated the impact of different macronutrient distributions and varying caloric intakes along with regular exercise for metabolic and physiological changes related to weight loss. One hundred forty-one sedentary, obese women (38.7 Â± 8.0 yrs, 163.3 Â± 6.9 cm, 93.2 Â± 16.5 kg, 35.0 Â± 6.2 kgâ€¢m^-2, 44.8 Â± 4.2% fat) were randomized to either no diet + no exercise control group (CON) a no diet + exercise control (ND), or one of four diet+exercise groups (high-energy diet [HED], very low carbohydrate, high protein diet [VLCHP], low carbohydrate, moderate protein diet [LCMP] and high carbohydrate, low protein [HCLP]) in addition to beginning a 3x/week^{-1} supervised resistance training program. After 0, 1, 10 and 14 weeks, all participants completed testing sessions which included anthropometric, body composition, energy expenditure, fasting blood samples, aerobic and muscular fitness assessments. Data were analyzed using repeated measures ANOVA with an alpha of 0.05 with LSD post-hoc analysis when appropriate. No significant changes occurred in lipid panel constituents, but serum insulin and HOMA-IR values decreased in the VLCHP group. Significant reductions in serum leptin occurred in all caloric restriction + exercise groups after 14 weeks, which were unchanged in other non-diet/non-exercise groups.

Ruth S.M Chan and Jean Woo (2010) obesity is a public health problem that has become epidemic worldwide. Substantial literature has emerged to show that overweight and obesity are major causes of co-morbidities, including type II
diabetes, cardiovascular diseases, various cancers and other health problems, which can lead to further morbidity and mortality. The related health care costs are also substantial. Therefore, a public health approach to develop population-based strategies for the prevention of excess weight gain is of great importance. However, public health intervention programs have had limited success in tackling the rising prevalence of obesity. This paper reviews the definition of overweight and obesity and the variations with age and ethnicity; health consequences and factors contributing to the development of obesity; and critically reviews the effectiveness of current public health strategies for risk factor reduction and obesity prevention.

**Teresa Kulie et al. (2010)** obesity negatively impacts the health of women in many ways. Being overweight or obese increases the relative risk of diabetes and coronary artery disease in women. Women who are obese have a higher risk of low back pain and knee osteoarthritis. Obesity negatively affects both contraception and fertility as well. Maternal obesity is linked with higher rates of cesarean section as well as higher rates of high-risk obstetrical conditions such as diabetes and hypertension. Pregnancy outcomes are negatively affected by maternal obesity (increased risk of neonatal mortality and malformations). Maternal obesity is associated with a decreased intention to breastfeed, decreased initiation of breastfeeding, and decreased duration of breastfeeding. There seems to be an association between obesity and depression in women, though cultural factors may influence this association. Obese women are at higher risk for multiple cancers, including endometrial cancer, cervical cancer, breast cancer, and perhaps ovarian cancer.

**Levy et al. (2009)** examined the impact of obesity on the health statues of people with intellectual disability in a quantitative study in the United States. Date was collected from a community based specialty medical practice for people with intellectual disability using administrative service records, medical records and developmental disabilities profile. Participants were required to have had a primary care visit between 1 July 2001 and 30 June 2005. Information obtained
included height, weight, diagnosis of hypertension, diagnosis of hypercholesterolemia (high cholesterol), diagnosis of diabetes mellitus, smoking statues and if there was any use of psychotropic medication. Results exhort a direct link between the level of obesity and the presents of any other health condition investigated within the study. Out of the 43 % of people that were obese, 35.7% suffered hypercholesterolemia, 25.4% had hypertension, 19.3% displayed frequent behavioural problems and 7.1% had diabetes mellitus.

The development of Type 2 diabetes and hypertension rises steeply with increasing body fatness. Confined to older adults for most of the 20th century, this disease now affects obese children even before puberty. Approximately 85% of people with diabetes are type 2, and of these, 90% are obese or overweight. And this is increasingly becoming a developing world problem. If current trends continue, India will have taken over by 2025 (Anonymous, 2009c).

Tsigos et al. (2008) studied obesity increases the risk of death from cardiovascular diseases and cancers. Its metabolic complications as well as the increased risk of respiratory diseases, osteoarthritis, gastrointestinal problems together with problems in reproductive health or psychological and social consequences are all severe implications of long-term obesity.

F. Xavier and Pi Sunyer (2006) studied the medical hazards of obesity are discussed. Risks include insulin resistance, diabetes mellitus, hypertriglycerideridemia, decreased levels of high-density lipoprotein cholesterol, and increased levels of low density lipoprotein cholesterol. Obesity is also associated with gallbladder disease and some forms of cancer as well as sleep apnea, chronic hypoxia and hypercapnia, and degenerative joint disease. Obesity is an independent risk factor for death from coronary heart disease. A central distribution of body fat enhances the risk for most of these conditions.

Giovanni et al. (2005) studied the association of body fat distribution and body composition with flow-resistance relations in overweight population. They Studied 521 overweight, nonobese participants, fat free mass (FFM) and fat mass
(FM) were measured by bioelectric impedance. Body composition was estimated as FM/FFM and found out that central fat distribution (CFD) is associated with more severe abnormalities in body composition and with higher CO (cardiac output) independently of FFM in overweight, nonobese subjects.

2. STRATEGIES FOR WEIGHT MANAGEMENT

(a) Dietary management and Exercise

(b) Behavior and life style change

(c) Nutrition education and counseling

(a) Dietary management and Exercise

Fundamental to treatment of obesity is reduction in the number of calories consumed. An overall decrease in the number of calories is necessary for weight loss to occur, with emphasis on consumption of raw fruits and vegetables, protein, fiber, and should be sufficient in nutrients and vitamins. Decreasing intake of processed foods, sugars, salts, fats, oils, and nutritionally-dense foods should be encouraged. The specific diet is best developed in consultation with a registered dietician.

Assim Alfadda et al. (2016) to assist healthcare providers in evidence-based clinical decision-making for the management of overweight and obese adults in Saudi Arabia. These included strong recommendations in support of lifestyle interventions rather than usual care alone, individualized counseling interventions rather than generic educational pamphlets, physical activity rather than no physical activity, and physical activity in addition to diet rather than diet alone. Metformin and orlistat were suggested as conditional recommendations for the management of overweight and obesity in adults. Bariatric surgery was recommended, conditionally, for the management of obese adults (body mass index of ≥40 or ≥35 kg/m2 with co morbidities. The current guideline includes recommendation for the non-pharmacological, pharmacological, and surgical management of overweight and obese adults. In addition, the panel recommends...
conducting research priorities regarding lifestyle interventions and economic analysis of drug therapy within the Saudi context, as well as long term benefits and harms of bariatric surgery.

Anjali and Manisha Sabharwal (2015) evaluated effectiveness of Lifestyle Interventions among College Students. College students are young adults in a transition phase who have the potential for positive behaviour changes via lifestyle interventions. These primary prevention strategies are expected to be more realistic and cost-effective, as compared with clinical treatment and can even be helpful in developing countries. A number of the intervention approaches via various techniques have shown significant and beneficial changes in dietary and exercise habits among college students. All the interventions with in the duration of 1 month to 7 months have shown significant improvement in the dietary and physical activity habits of the college students. These interventions also resulted in significant improvement in fruits and vegetables consumption as well as in behavioural control and weight loss. Some studies have reported that intervention resulted in improvement in health behaviour, and in physical fitness along with increased self-regulatory strategies. However, short-term lifestyle changes are evident as reflected in several studies but the long-term effectiveness of interventions is unknown. Therefore, long term effectiveness of the interventions need to focused for the behavioural change.

Johns DJ et al. (2015) assessed weight loss can reduce the health risks associated with being overweight or obese. Aimed to examine the clinical effectiveness of combined behavioral weight management programs (BWMPs) targeting weight loss in comparison to single component programs, using within study comparisons. We included randomized controlled trials of combined BWMPs compared with diet-only or physical activity-only programs with at least 12 months of follow-up, conducted in overweight and obese adults (body mass index ≥25). Systematic searches of nine databases were run and two reviewers extracted data independently. Random effects meta-analyses were conducted for mean difference in weight change at 3 to 6 months and 12 to 18 months using a baseline
observation carried forward approach for combined BWMPs vs diet-only BWMPs and combined BWMPs vs physical activity-only BWMPs. Weight loss is similar in the short-term for diet-only and combined BWMPs but in the longer-term weight loss is increased when diet and physical activity are combined. Programs based on physical activity alone are less effective than combined BWMPs in both the short and long term.

Suzanne Audrey et al. (2014) examined the contribution to adult physical activity levels of walking to work. Employees (n = 103; 36.3 ± 11.7 years) at 17 workplaces in south-west England, who lived within 2 miles (3.2 km) of their workplace, wore Actigraph accelerometers for seven days during waking hours and carried GPS receivers during the commute to and from work. Physical activity volume (accelerometer counts per minute (cpm)) and intensity (minutes of moderate to vigorous physical activity (MVPA)) were computed overall and during the walk to work. Total weekday physical activity was 45% higher in participants who walked to work compared to those travelling by car (524.6 ± 170.4 vs 364.6 ± 138.4 cpm) and MVPA almost 60% higher (78.1 ± 24.9 vs 49.8 ± 25.2 minutes per day). No differences were seen in weekend physical activity, and sedentary time did not differ between the groups. Combined accelerometer and GPS data showed that walking to work contributed 47.3% of total weekday MVPA. Walking to work was associated with overall higher levels of physical activity in young and middle-aged adults. These data provide preliminary evidence to underpin the need for interventions to increase active commuting, specifically walking, in adults.

Nisha Shinde et al. (2013) obesity is becoming a serious Global Public Health issue especially in developed countries. Evidence indicates that obesity is associated with wide range of health conditions including respiratory diseases can result in altered respiratory function. Yoga is a form of physical activity which may assist in achieving recommended levels of physical fitness. Yoga may be attractive as an aerobic training program because it requires little space and no equipment. Some yoga postures helps to reduce weight with significant health
benefits. Prospective comparative cross sectional study was conducted in Rural Community. Total 60 subjects male and females diagnosed with Obesity from medicine dept. PMT, Loni. by the WHO criteria. Out of sixty thirty subjects were divided into two groups by block random sampling method that is group I and II. After explaining procedure both groups were revaluated for baseline parameters like B.M.I. and pulmonary functions. (MVV, FEV1/FVC) group I started with aerobic exercise that is walking and Group II started with pranayama & postures of yoga that can help to reduce weight. Statistical analysis was done for comparison of both groups. After applying “ t ” test pre yoga practice and aerobics also post yoga and aerobics practice data shows highly significance difference between mean and standard deviation values of all parameters in group II (Yoga group) i.e. (p <0.01) Our study concludes that regular practice of yoga is really helpful in weight reduction & improves the pulmonary functions.

Kwong Ming Fock and Joan Khoo (2013) according to World Health Organization, in 2010 there were over 1 billion overweight adults worldwide with 400 million adults who were obese. Obesity is a major risk factor for diabetes, cardiovascular disease, musculoskeletal disorders, obstructive sleep apnea, and cancers (prostate, colorectal, endometrial, and breast). The main treatment for obesity is dieting, augmented by physical exercise and supported by cognitive behavioral therapy. Calorie-restriction strategies are one of the most common dietary plans. After reaching the desired body weight, the amount of dietary calories consumed can be increased gradually to maintain a balance between calories consumed and calories expended. Regular physical exercise enhances the efficiency of diet through increase in the satiating efficiency of a fixed meal, and is useful for maintaining diet-induced weight loss. A meta-analysis by Franz found that by calorie restriction and exercise, weight loss of 5–8.5 kg was observed 6 months after intervention. After 48 months, a mean of 3–6 kg was maintained. In conclusion, there is evidence that obesity is preventable and treatable. Dieting and physical exercise can produce weight loss that can be maintained.
E Stewart and R S J Keast (2012) evaluated the effects of a high-fat and low-fat diet on taste sensitivity to oleic acid (C18:1) in lean and overweight/obese (OW/OB) subjects. Randomized cross-over dietary intervention involving the consumption of a high-fat (>45% fat) and low-fat (<20% fat) diet, both consumed over a 4-week period. A total of 19 lean, mean age 33±13 years, mean body mass index (BMI) 23.2±2.2 kg m⁻² and 12 OW/OB, mean age 39.5±3 years, mean BMI 28±2.6 kg m⁻², subjects participated in the study, which measured taste thresholds for C18:1, fat perception and hedonic ratings for regular (RF) and lowered-fat (LF) foods before, and following consumption of a high- and low-fat diet. Consumption of the low-fat diet increased taste sensitivity to C18:1 among lean and OW/OB subjects (P<0.05) and increased the subjects ability to perceive small differences in the fat content of custard (P=0.05). Consumption of the high-fat diet significantly decreased taste sensitivity to C18:1 among lean subjects (P<0.05), with no change in sensitivity among OW/OB persons (P=0.609). The hedonic ratings for several RF and LF foods differed following the diets.

Harrapion et al. (2011) investigated the dietary factors associated with body mass index (BMI) and waist circumference (WC). Anthropometric measurements and 3-day diet diary were collected from study subjects (Men = 485, Women = 362). Results revealed that total energy intake (CHO, Protein and Fat intake) were significantly higher in obese subjects than lean subjects in both genders. Further it was found that alcohol intake has positively associated with BMI and waist circumferemence in obese subjects.

Sherry M. Adkins (2011) the purpose of this project was to describe primary care physician adherence to National Heart Lung and Blood Institute (NHLBI) Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults (1998) and to explore patient characteristics associated with physician assessment and management behaviors. Patient characteristics included age, sex, race, BMI, associated disease risk, and Medicaid coverage. A chart abstraction of 99 randomly selected adult patients with at least one visit to a particular primary care practice during a 12-month period was completed. The
Physician Obesity Guideline Behavior Scale was developed to score physician obesity assessment and management behavior as recorded in the patient chart. All patients had a weight recorded in the chart, 84% had a height included, and 82% had a documented BMI. Weight-related management was minimal. The majority of patients did not receive any dietary (72%) or physical activity (69%) management. When dietary management was introduced, patients received either information (68%) or a goal (32%), and none received a goal with a plan. In cases where physical activity management was introduced, patients received information (39%) or a goal (52%), with few (10%) receiving a goal with accompanying plan. Physician assessment and management behaviors varied by patient BMI when controlled for race, insurance, and risk.

**Bettina Schaar et al. (2010)** a systematic search was conducted of the available literature published between 1993 and 2006 that covered randomized controlled trials on overweight and obese subjects who underwent treatment consisting of physical exercise and/or changes in diet. The scope of the search thus incorporated seven relevant databases. Using 6,545 key word combinations, the electronic search yielded a total of 36,869 abstracts. 13 relevant studies with a total of 826 subjects (BMI > 25; 17 - 68 years of age) met the meta-analysis criteria. The courses of treatment included “diet (d)”, “physical exercise (pe)”, “diet and physical exercise (dpe)”, and “no intervention (ni)”. The results confirmed the hypothesis that the combined intervention “dpe” had the greatest effect with regard to weight loss. The single treatments “pe” and “d” also led to weight loss, with “d” having a significantly greater effect than “pe”. A common error was a failure to assign subjects randomly to the different treatment groups. The results of our meta-analysis indicate that a combination of diet and physical exercise is the best form of treatment to induce weight loss in overweight individuals in the first weeks, followed by physical exercise to maintain weight loss.

**Bhavin N Vadera et al. (2010)** the objectives were to find the prevalence of overweight and obesity in the urban population of Jamnagar and to explore the
effect of dietary factors on the weight status of the people. A cross-sectional study was conducted among the adult population of Jamnagar city. Cluster sampling technique was used to select study samples. Data were collected in a prestructured questionnaire by interviewing subjects through house-to-house visits. Data were analyzed in Epi Info and appropriate statistical methods were used. The prevalence of overweight and obesity was found to be 22.04% and 5.20%, respectively. Overweight was more prevalent in females than males. The prevalence rose with an increase in age up to 60 years. Among dietary factors, the total calorie intake and habit of snacking had a positive association with weight gain (P < 0.05). The mean intake of oil was more and the mean intake of vegetables was less among overweight subjects than non overweight subjects (P < 0.05). The prevalence of overweight and obesity in the urban population in Jamnagar was found to be 22.04% and 5.20%, respectively. Total calorie intake as well as composition of diet was the important dietary factor affecting weight gain.

Esteve Llargues et al. (2009) evaluated the efficacy of an intervention on food habits and physical activity in school children. A 2-year cluster-randomized prospective study with two parallel arms was used to evaluate an intervention programme in children in their first year of primary schooling (5–6 years of age) in schools in the city of Granollers. The intervention consisted of the promotion of healthy eating habits and physical activity by means of the educational methodology Investigation. At the beginning and at the end of the study (2006 and 2008) the weight and height of each child was measured in situ, while the families were given a self-report physical activity questionnaire. Plus quick test. Two years after the beginning of the study, the body mass index of the children in the control group was 0.89 kg/m² higher than that of the intervention schools. The intervention reduced by 62% the prevalence of overweight children. Similarly, the proportion of children that ate a second piece of fruit and took part in an after-school physical activity increased in the intervention group. In the control group, the weekly consumption of fish was reduced. The educational intervention in healthy eating habits and physical activity in the school could contribute to lessen the current increase in child obesity.
Jayalaxmi and John (2008) assessed the nutritional status and food habits of Irular tribes of Vellore district and found that traditional beliefs still play a role among the tribes. Food rich in calcium like small dry fish and protein rich groundnuts, fish and chicken, the locally available iron containing jaggery are avoided during pregnancy. In the same way the nutritious, locally available and cost less guava and papaya are avoided during lactation.

Recette et al. (2008) also studied changes in weight and dietary intake in college students. Results regulated that a significant increase in obesity from 15% in the 1st year to 23% in last year of college. It was observed that a healthy, pattern ex. – high intake of fruits and veg. was followed by only 30% student. Half of the participants consumed high fat fast food and fried foods at least twice in a day.

There was a statically significant difference noted in the likening of fried foods and fast food between obese and overweight persons and persons with normal body mass index. Researchers concluded that obesity in a chronic illness. Early detection of it can prevent various complication associated with it. BMI plays a crucial role in its early detection or it is simple to calculate and can even detect the pre-obesity stage in time.

Castillan et al. (2007) carried out a study to find an association between dietary pattern and the risk of obesity. A total of 34000 adults were reelected in a study and data on anthropometric measurements, dietary intake were collected using an interview schedule. It was found that higher consumption of fatty foods like fast food, fried food, was positively associated with BMI and waist circumferences (WC). According to the authors high intake of fatty foods could be the major factor for the development of obesity and central body fat deposition in adults.

Szygula et al. (2006) studied the effect of combined physical activity and diet therapy on body composition of medium obese population. Fifty six women and 15 men were selected and placed on a low calorie diet and undertook various physical activities. Changes in body mass, BMI, lean body mass, waist hip ratio, fat mass and skinfold measurements were determined and found that body mass, fat contents and BMI decreased in all groups after 2 weeks of therapy.
Curioni CC et al. (2005) assessed the effectiveness of dietary interventions and exercise in long-term weight loss in overweight and obese people. Overweight and obese adults-18 years old or older with body mass index (calculated as weight divided by the square of height in meters) $>25$. Randomised clinical trials comparing diet and exercise interventions vs diet alone. All trials included a follow-up of 1 y after intervention. A chi-squared test was used to assess statistical heterogeneity. A total of 33 trials evaluating diet, exercise or diet and exercise were found. Only 6 studies directly comparing diet and exercise vs diet alone were included (3 additional studies reporting repeated observations were excluded). The active intervention period ranged between 10 and 52 weeks across studies. Diet associated with exercise produced a 20% greater initial weight loss. (13 kg vs 9.9 kg; $z=1.86-p=0.063$, 95%CI). The combined intervention also resulted in a 20% greater sustained weight loss after 1 y (6.7 kg vs 4.5 kg; $z=1.89-p=0.058$, 95%CI) than diet alone. In both groups, almost half of the initial weight loss was regained after 1 y. Diet associated with exercise results in significant and clinically meaningful initial weight loss. This is partially sustained after 1 year.

(b) Behavior and life style change

Behavior therapy is a useful adjunct to diet and physical activity. The clinician should assess patient motivation and readiness to implement the weight management plan and take steps to motivate the patient for treatment. Behavior strategies to promote diet and exercise should be used routinely, as they are helpful in achieving weight loss and maintenance.

Ruth Peters and Nigel Beckett (2016) studied overweight/obesity as a risk factor for incident dementia differs between mid-life and later life. We performed a systematic review and meta-analysis of the up-to-date current literature to assess this. inclusion criteria included epidemiological longitudinal studies published up to September 2014, in participants without cognitive impairment based on evidence of cognitive assessment and aged 30 or over at baseline assessment with at least 2 years of follow-up. Pubmed, Medline, EMBASE, PsychInfo and the
Cochrane Library were searched using combinations of the search terms: Dementia, Alzheimer disease, Vascular Dementia, Multi-Infarct Dementia, Cognitive decline, Cognitive impairment, Mild Cognitive Impairment/Obesity, Overweight, Adiposity, Waist circumference (limits: humans, English language). Handsearching of all papers meeting the inclusion criteria was performed. A random-effects model was used for the meta-analysis. The 1,612 abstracts identified and reviewed, 21 completely met the inclusion criteria. Being obese below the age of 65 years had a positive association on incident dementia with a risk ratio (RR) 1.41 (95% confidence interval, CI: 1.20–1.66), but the opposite was seen in those aged 65. This systematic review and meta-analysis suggests a positive association between obesity in mid-life and later dementia but the opposite in late life. Whether weight reduction in mid-life reduces risk is worthy of further study.

Jodie T Allen et al. (2015) examined the ways in which participants’ attitudes and beliefs about accessing a commercial weight management programme via their doctor relate to their weight-loss experience, and to understand how these contextual factors influence motivation and adherence to the intervention. A qualitative study embedded in a randomised controlled trial evaluating primary care referral to a commercial weight-loss programme in adults who are overweight or obese in England. The study took place from June–September 2013. Twenty-nine participants (body mass index [BMI] ≥28 kg/m²; age ≥18 years), who took part in the WRAP (Weight Loss Referrals for Adults in Primary Care) trial, were recruited at their 3-month assessment appointment to participate in a semi-structured interview about their experience of the intervention and weight management more generally. Interviews were audio recorded, transcribed verbatim, and analyzed inductively using a narrative approach. Although participants view the lifestyle-based, non-medical commercial programme as an appropriate intervention for weight management, the referral from the GP and subsequent clinical assessments frame their experience of the intervention as medically pertinent with clear health benefits. Referral by the GP and follow-up assessment appointments were integral to participant experiences of the
intervention, and could be adapted for use in general practice potentially to augment treatment effects.

KE Foster-Schubert et al. (2014) conducted a year-long, 4-arm randomized trial among 439 overweight-to-obese postmenopausal sedentary women to determine the effects of a calorie-reduced, low-fat diet (D), a moderate-intensity, facility-based aerobic exercise program (E), or the combination of both interventions (D+E), vs. a no-lifestyle-change control (C) on change in body weight and composition. The group-based dietary intervention had a weight-reduction goal of ≥10%, and the exercise intervention consisted of a gradual escalation to 45 min aerobic exercise 5 d/wk. Participants were predominantly non-Hispanic Whites (85%) with a mean age of 58.0±5.0 years, a mean BMI of 30.9±4.0 kg/m² and an average of 47.8±4.4% body fat. Baseline and 12-month weight and adiposity measures were obtained by staff blinded to participants’ intervention assignment. 399 women completed the trial (91% retention). Using an intention-to-treat analysis, average weight loss at 12 months was −8.5% for the D group (P<0.0001 vs. C), −2.4% for the E group (P=0.03 vs. C), and −10.8% for the D+E group (P<0.0001 vs. C), while the C group experienced a non-significant −0.8% decrease. BMI, waist circumference, and % body fat were also similarly reduced. Among postmenopausal women, lifestyle change involving diet, exercise, or both combined over 1 year improves body weight and adiposity, with the greatest change arising from the combined intervention.

Rashmi Shankar and M. Komala et al. (2014) studied the World Health organization (WHO) defines obesity as ‘global epidemic’. It was estimated that around 400 million people were suffering from obesity in which 84 million were teenagers. There are various factors that can cause obesity among teenagers and unhealthy lifestyle is on the top in the list. In the present study an attempt was made to investigate the relationship between lifestyle factors such as television viewing, physical activities and obesity among teenagers of Mysore city. The study has consisted 240 teenagers aged 13–17 years, studying in high schools and colleges of Mysore city. Anthropometric measurements and information on
television viewing behaviors, physical activities carried out daily, and consumption of foods during television viewing were collected. The findings revealed that 81.6% of the teenagers were overweight (37.91%) and obese (43.75%) according to weight for height. Teenagers had spent average time of 1 hr 50 min per day and 2 hr 17 min on weekend on television viewing. The results of this study proved that body weight of the teenagers significantly correlates with television viewing time and time spent on physical activities.

Susan Z. Yanovski et al. (2014) studied thirty-six percent of US adults are obese and many cannot lose sufficient weight to improve health with lifestyle interventions alone. Conduct a systematic review of medications currently approved in the US for obesity treatment in adults. A PubMed search from inception through September, 2013 was performed to find meta-analyses, systematic reviews, and randomized, placebo-controlled trials for currently-approved obesity medications lasting ≥1y, that had a primary or secondary outcome of body weight, included ≥50 participants per group, reported ≥50% retention, and reported results on an intention-to-treat basis. Obesity medications approved for long-term use, when prescribed with lifestyle interventions, produce additional weight loss relative to placebo ranging from approximately 3% of initial weight for orlistat and lorcaserin to 9% for top-dose (15/92mg) phentermine/topiramate-ER at 1y. The proportion of patients achieving clinically-meaningful (≥5%) weight loss ranges from 37–47% for lorcaserin, 35–73% for orlistat, and 67–70% for top-dose phentermine/topiramate-ER. All three produce greater improvements in many cardiometabolic risk factors than placebo, but no obesity medication has been shown to reduce cardiovascular morbidity or mortality. Medications approved for long-term obesity treatment, when used as an adjunct to lifestyle intervention, lead to greater mean weight loss and an increased likelihood of achieving clinically-meaningful 1-year weight loss relative to placebo. By discontinuing medication in patients who do not respond with weight loss ≥5%, clinicians can decrease their patients’ exposure to the risks and costs of drug treatment when there is little prospect of long-term benefit.
Awosan et al. (2013) conducted a study to assess the dietary pattern, lifestyle, nutrition status and prevalence of hypertension among traders in Sokoto, Nigeria. A cross sectional descriptive study was conducted among 390 traders selected by multistage sampling technique from November to December, 2012. Anthropometric and blood pressure measurements were done for the participants, together with questionnaire administration. High prevalence of unhealthy eating habits was recorded among the participants; 50.7% eat their largest meal at dinner, 49.9% eat snacks everyday, 66.7% eat fatty foods, 27.1% and 33.0% drink fruit juice and carbonated drinks, respectively thrice weekly or more, 56.0 and 58.8% eat fruits and vegetables, respectively less than thrice in a week or not at all. Also, 50.7% live a sedentary lifestyle, 5.2% currently smoke cigarette and 10.8% had consumed alcohol within the past 30 days. Similarly, the prevalence of overweight (28.9%), obesity (28.1%) and hypertension (29.1%) was high among the participants. This study demonstrated high prevalence of unhealthy eating habits and lifestyle; together with high prevalence of overweight, obesity and hypertension among traders in Sokoto.

Riccardo Dalle Grave et al. (2013) it is very unlikely that our obesity-promoting environment will change in the near future. It is therefore mandatory to improve our knowledge of the main factors associated with successful adoption of obesity-reducing behaviors. This may help design more powerful procedures and strategies to facilitate the adoption of healthy lifestyles in a “toxic” environment favoring the development of a positive energy balance. The aim of this review is to describe the main factors associated with successful adoption of obesity-reducing behaviors and to describe the most recent development, limits, and outcomes of lifestyle modification programs. The evidence regarding predictors of weight loss and weight loss maintenance remains largely incomplete. It is necessary to develop strategies matching treatments to patients’ needs to improve successful weight loss and its maintenance. How to detect and how to address these needs is a continuous, challenging, research problem.
**Thomas A. Wadden et al. (2012)** expert panels sponsored by both the World Health Organization and the National Institutes of Health have recommended that obese adults (ie, body mass index $\geq 30$ kg/m$^2$), as well as those who are overweight (body mass index of 25–29.9 kg/m$^2$) and have co morbid conditions, lose 10% of their initial weight. A comprehensive program of lifestyle modification is considered the first option for achieving this goal. Lifestyle modification, also referred to as behavioral weight control, includes 3 primary components: diet, exercise, and behavior therapy. This narrative review examines weight losses achieved with this approach, as well as new developments with each of the 3 components.

**Jennifer Lemacks et al. (2011)** evaluated systematically review the literature on clinical outcomes of diet and physical activity interventions conducted among adult African American populations in the United States. We used the Preferred Reporting Items for Systematic Review and Meta Analysis construct in our review. We searched Medline (PubMed and Ovid), Cochrane, and DARE databases and restricted our search to articles published in English from January 2000 through December 2011. We included studies of educational interventions with clinically relevant outcomes and excluded studies that dealt with non adult populations or populations with pre-existing catabolic or other complicated disorders, that did not focus on African Americans, that provided no quantitative baseline or follow-up data, or that included no diet or physical activity education or intervention. We report retention and attendance rates, study setting, program sustainability, behavior theory, and education components. Nineteen studies were eligible for closer analysis. These studies described interventions for improving diet or physical activity as indicators of health promotion and disease prevention and that reported significant improvement in clinical outcomes. Our review suggests that nutrition and physical activity educational interventions can be successful in improving clinically relevant outcomes among African Americans in the United States.
Hitomi Saito et al. (2009) studied behaviour modification is essential for the prevention and treatment of obesity, which is one of the critical risk factors for lifestyle-related diseases. However, it is extremely difficult to encourage people to modify their behaviour in order to achieve a healthier lifestyle because lifestyles largely depend on individual beliefs and values. For this reason, a behavioural scientific approach would be helpful. It is also important to note that lifestyle-related diseases are closely associated with psychosocial stress. Thus, it is necessary to assess obese patients’ psychosocial status and to provide them with psychological support.

Giovanna Turconi et al. (2008) evaluated eating habits and behaviors, and nutritional and food safety knowledge of a group of Italian adolescents. A dietary questionnaire previously constructed and tested was self-administered during school time. Each section was evaluated using a separate score. The study was carried out as a part of a nutritional surveillance project in the Aosta Valley Region, Northern Italy Five hundred and thirty-two adolescent subjects, aged 15.4 ± 0.7 years, attending the second year of secondary schools participated in the study. We evaluated eating habits, physical activity, meaning of healthy and unhealthy dietary habits and food, self-efficacy, barriers affecting healthy food choices, nutritional and food safety, weight, height, Body Mass Index (BMI). Only 37.0% of the sample have satisfactory eating habits; 18.5% have a very active lifestyle; only 8.6% have quite good nutritional knowledge, 2.4% have satisfactory food safety knowledge, although 43.7% have good hygiene practices. The results point out unhealthy behaviors influencing adolescents’ eating habits and suggest which of these must be considered in order to develop tailored nutrition interventions, improving adolescents’ consciousness aimed at adopting a healthy lifestyle.

Anne M. Wolf et al. (2007) evaluated program and health care costs of a lifestyle intervention in a high-risk obese population. Twelve-month randomized controlled trial comparing lifestyle case management to usual care. Lifestyle case management entailed individual and group education, support, and referrals by
registered dietitians. Those in the usual-care group received educational material. Net cost of the intervention was $328 per person per year. After incorporating program costs, mean health plan costs were $3,586 (95% confidence interval [CI]: −$8,036, −$25, \( P<0.05 \)) lower in case management compared to usual care. The difference was driven by group differences in medical (−$3,316, 95% CI: −$7,829 to −$320, \( P<0.05 \)) but not pharmaceutical costs (−$239, 95% CI: −$870 to $280, not statistically significant), with fewer inpatient admissions and costs among case management compared with usual care (admission prevalence: 2.8% vs 22.5% respectively, \( P<0.001 \)). The findings can be judiciously applied to support that the addition of a registered dietitian–led lifestyle case-management program to medical care does not increase health care costs.

CC Curioni and P M Lourenço (2005) assessed the effectiveness of dietary interventions and exercise in long-term weight loss in overweight and obese people. A systematic review with meta-analysis. Overweight and obese adults—18 years old or older with body mass index (calculated as weight divided by the square of height in meters)>25. A total of 33 trials evaluating diet, exercise or diet and exercise were found. Only 6 studies directly comparing diet and exercise vs diet alone were included (3 additional studies reporting repeated observations were excluded). The active intervention period ranged between 10 and 52 weeks across studies. Diet associated with exercise produced a 20% greater initial weight loss. (13 kg vs 9.9 kg; \( z=1.86—p=0.063, 95\%\)CI). The combined intervention also resulted in a 20% greater sustained weight loss after 1 y (6.7 kg vs 4.5 kg; \( z=1.89—p=0.058, 95\%\)CI) than diet alone. In both groups, almost half of the initial weight loss was regained after 1 y. Diet associated with exercise results in significant and clinically meaningful initial weight loss. This is partially sustained after 1 year.

Gary D Foster et al. (2005) evaluated behavioral treatment is an approach used to help individuals develop a set of skills to achieve a healthier weight. It is more than helping people to decide what to change; it is helping them identify how to change. The behavior change process is facilitated through the use of self-
monitoring, goal setting, and problem solving. Studies suggest that behavioral treatment produces weight loss of 8–10% during the first 6 mo of treatment. Structured approaches such as meal replacements and food provision have been shown to increase the magnitude of weight loss. Most research on behavioral treatment has been conducted in university-based clinic programs. Although such studies are important, they tell us little about the effectiveness of these approaches in settings outside of specialized clinics. Future research might focus more on determining how these behavioral techniques can be best applied in a real-world setting.

Thomas et al. (2005) determined a comprehensive program of lifestyle modification induces loss of ~10% of initial weight in 16 to 26 weeks, as revealed by a review of recent randomized controlled trials, including the Diabetes Prevention Program. Long-term weight control is facilitated by continued patient-therapist contact, whether provided in person or by telephone, mail, or e-mail. High levels of physical activity and the consumption of low-calorie, portion-controlled meals, including liquid meal replacements, can also help maintain weight loss. Additional studies are needed of the effects of macronutrient content (e.g., low-fat vs. low-carbohydrate diets) on long-term changes in weight and health. Research also is needed on effective methods of providing comprehensive weight loss control to the millions of Americans who need it.

(c) Nutrition education and counseling

Nutrition education is an effort to improve the nutritional well being of people by assessing multiple factors that affect food choice tailoring, education methodologies and messages reaching the public and evaluating results. It can assist people in taking decision regarding their eating practice by applying knowledge from nutrition science.

David J. Johns et al. (2014) aimed to examine the clinical effectiveness of combined behavioral weight management programs (BWMPs) targeting weight loss in comparison to single component programs, using within study
comparisons. We included randomized controlled trials of combined BWMPs compared with diet-only or physical activity-only programs with at least 12 months of follow-up, conducted in overweight and obese adults (body mass index ≥25). Random effects meta-analyses were conducted for mean difference in weight change at 3 to 6 months and 12 to 18 months using a baseline observation carried forward approach for combined BWMPs vs diet-only BWMPs and combined BWMPs vs physical activity-only BWMPs. In total, eight studies were included, representing 1,022 participants, the majority of whom were women. Six studies met the inclusion criteria for combined BWMP vs diet-only. Results showed no significant difference in weight loss from baseline or at 3 to 6 months between the BWMPs and diet-only arms (−0.62 kg; 95% CI −1.67 to 0.44). Results showed significantly greater weight loss in the combined BWMPs at 3 to 6 months (−5.33 kg; 95% CI −7.61 to −3.04) and 12 to 18 months (−6.29 kg; 95% CI −7.33 to −5.25).

Kyle J. Mcinnis et al. (2013) studied obesity has reached epidemic proportions in the United States. More than 60 percent of U.S. adults are now overweight or obese (defined as at least 30 lb [13.6 kg] overweight), predisposing more than 97 million Americans to a host of chronic diseases and conditions. Physical activity has a positive effect on weight loss, total body fat, and body fat distribution, as well as maintenance of favorable body weight and change in body composition. Many of the protective aspects of exercise and activity appear to occur in overweight persons who gain fitness but remain overweight. Despite the well-known health and quality-of-life benefits of regular physical activity, few Americans are routinely active. Results of research studies have shown that physician intervention to discuss physical activity (including the wide array of health benefits and the potential barriers to being active) need not take more than three to five minutes during an office visit but can play a critical role in patient implementation.

Mandy Ho et al. (2013) studied to compare the effects of diet-only intervention with those of diet plus exercise or exercise only on weight loss and metabolic risk
reduction in overweight children. English-language articles from 1975 to 2010 available from 7 databases were reviewed. One person searched the databases. Two independent reviewers assessed abstracts and articles against the following eligibility criteria: randomized controlled trials conducted in overweight and obese children aged 18 years or younger, comparing dietary intervention with a diet plus exercise program or an exercise-only program. Study quality was critically appraised by 2 reviewers using established criteria. The main outcome measures were body mass index, body fat percentage, lean body mass, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, triglycerides, fasting glucose, and fasting insulin. Fifteen studies were identified and included. Based on the small number of short-term trials currently available, both diet-only and diet plus exercise interventions resulted in weight loss and metabolic profile improvement.

**Thomas G Wright et al. (2013)** assessed program compliance, weight loss and health benefits in different WHO obesity classes (Class I: BMI 30-34.9; Class II: BMI 35.0-39.9; Class III: BMI 40+) after a very low energy diet intervention. Obese participants (n=1012) attending a private weight control clinic enrolled in a 26 week program. The first 12 weeks involved restricted energy intake (800 kcal/day), then gradual reintroduction of normal food (1200-1300 kcal/day), in conjunction with behaviour management. Body mass index (BMI), body mass, girths, blood pressure, cholesterol, triglycerides and glucose were measured before, during and after the 26 week intervention. Low compliance was defined as completing only 1-12 weeks, medium compliance 13-20 weeks and high compliance 21-26 weeks of the program. Overall, 52% of participants achieved high compliance. Greater compliance resulted in greater weight loss and health profile changes across all obesity classes. With high compliance, for Class I, II and III groups respectively, 79, 77 and 79% lost 15% or more of initial body mass. Class III participants had greater reductions in body mass and most measured health markers than Class I and II persons. Higher program compliance is associated with greater weight reduction and health profile benefits in all WHO obesity classes, with larger changes occurring in the Class III group.
**Brindal E et al. (2012)** assessed the effect of different features of a web-based weight loss intervention using a 12-week repeated-measures randomized parallel design. We developed 7 sites representing 3 functional groups. A national mass media promotion was used to attract overweight/obese Australian adults (based on body mass index [BMI] calculated from self-reported heights and weights). Both supportive sites included tools, such as a weight tracker, meal planner, and networking platform. The personalized-supportive site included a meal planner that offered recommendations that were personalized using an algorithm based on a user’s preferences for certain foods.

In total, 435 participants provided a valid final weight at the 12-week follow-up. Intention-to-treat analyses (using multiple imputations) revealed that there were no statistically significant differences in weight loss between sites ($P = .42$). On average, participants lost 2.76% (SE 0.32%) of their initial body weight, with 23.7% (SE 3.7%) losing 5% or more of their initial weight. Within supportive conditions, the level of use of the online weight tracker was predictive of weight loss (model estimate = 0.34, $P < .001$). Age (model estimate = 0.04, $P < .001$) and initial BMI (model estimate = -0.03, $P < .002$) were associated with frequency of use of the weight tracker.

**Fatemeh Azizi Soeliman and Leila Azadbakht (2012)** studied to find the best diet or eating pattern to maintain a recent weight loss. They searched in PubMed and SCOPUS by using the following key words: Overweight, obesity, weight maintenance, weight regain, and diet therapy. Finally, we assessed 26 articles in the present article. Meal replacement, low carbohydrate-low glycemic index (GI) diet, high protein intake, and moderate fat consumption have shown some positive effects on weight maintenance. However, the results are controversial. A Dietary Approach to Stop Hypertension (DASH)-type diet seems helpful for weight maintenance although the need for more study has remained. Some special behaviors were associated with less weight regain, such as, not being awake late at night, drinking lower amount of sugar-sweetened beverages, and following a healthy pattern. Some special foods have been suggested for weight maintenance.
However, the roles of specific foods are not confirmed. Healthy diets recommend low carbohydrate, low GI, and moderate fat foods, but it is not clear whether they are useful in preventing weight gain. It seems that consuming fewer calories helps people to keep weight loss. Further research to find strategies in obesity management focusing on successful maintenance of weight loss is needed.

Keränen, Anna-Maria (2011) studied prevalence of working-aged weight losers is high because of high prevalence of obesity. Eighty-two overweight or obese subjects (body mass index >27) participated in either intensive (n=35) or short-term (n=47) weight loss counselling in a randomized weight loss follow-up study lasting 18 months. The weight loss results were not maintained in either of the groups. The cognitive restraint increased and the emotional eating, uncontrolled eating and binge eating symptoms decreased in both groups. There were subjects in both counselling groups who succeeded in weight loss (weight loss result 9.3±6.3%) and those who failed (gained 3.3±1.7% of body weight). Those who succeeded had the highest score for cognitive restraint and lowest for uncontrolled eating, binge eating and emotional eating. In failure group, the scores for uncontrolled eating and binge eating were the highest already at the beginning of study. Those with the highest cognitive restraint at 18 months reported low intake of energy and fat while their intake of carbohydrates and fibre was high. Anhedonia existed in 24.4% of the participants at least once during the study period. They had higher binge eating scores continously, more uncontrolled eating and emotional eating at 6 months and they lost less weight than those without anhedonia. Thirty-two participants (39%) discontinued the study. The association of eating behavior with weight loss and dietary intake suggest that enhancing eating behavior could be a target for improving the success of weight loss.

Linda Bacon and Lucy Aphramor (2011) current guidelines recommend that "overweight" and "obese" individuals lose weight through engaging in lifestyle modification involving diet, exercise and other behavior change. This approach reliably induces short term weight loss, but the majority of individuals are unable to maintain weight loss over the long term and do not achieve the putative benefits
of improved morbidity and mortality. Concern has arisen that this weight focus is not only ineffective at producing thinner, healthier bodies, but may also have unintended consequences, contributing to food and body preoccupation, repeated cycles of weight loss and regain, distraction from other personal health goals and wider health determinants, reduced self-esteem, eating disorders, other health decrement, and weight stigmatization and discrimination. This concern has drawn increased attention to the ethical implications of recommending treatment that may be ineffective or damaging.

**Walsh and Nelson (2010)** observed the importance of increasing young men’s competencies in relation to food, and called for educators to consider the variety of factors which influences how young men think about food and the role it plays in their lives. Other researchers have similarly called for ‘innovative approaches’, including the importance of using participant suggestions in developing nutrition programs and the use of internet-based nutritional information in informing young adults.

**Anderson et al. (2009)** studied the results of a systematic review of the effectiveness of worksite nutrition and physical activity programs to promote healthy weight among employees. These results form the basis for the recommendation by the Task Force on Community Preventive Services on the use of these interventions. Weight-related outcomes, including weight in pounds or kilograms, BMI, and percentage body fat were used to assess effectiveness of these programs. This review found that worksite nutrition and physical activity programs achieve modest improvements in employee weight status at the 6–12-month follow-up. A pooled effect estimate of _2.8 pounds (95% CI _4.6, _1.0) was found based on nine RCTs, and a decrease in BMI of _0.5 (95% CI _0.8, _0.2) was found based on six RCTs. The findings appear to be applicable to both male and female employees, across a range of worksite settings. Most of the studies combined informational and behavioral strategies to influence diet and physical activity; fewer studies modified the work environment (e.g., cafeteria, exercise facilities) to promote healthy choices. Information about other effects,
barriers to implementation, cost and cost effectiveness of interventions, and research gaps are also presented in this article.

C Banwell et al. (2009) reported on a study of the transition, focusing on "lifestyle" factors such as diet (fried foods, soft drinks, Western-style fast foods) and physical activity (mild, moderate, strenuous exercise, housework/gardening and screen time). A baseline survey was administered to 87,134 adult students from all regions of Thailand attending an open university. 54% of the cohort was female. Participants' median age was 29 years. By self-reported Asian standards, 16% of the sample was obese (body mass index (BMI) $\geq 25$) and 15% overweight at risk (BMI $\approx 23-24.9$). Men were twice as likely as women to be overweight (21% vs 9%) or obese (23% vs 10%). Obesity was associated with urban residence and doing little housework or gardening and with spending more than 4 hours a day watching television or using computers. The latter occurred among 30% of the cohort, with a population attributable fraction (PAF) suggesting that it accounts for 11% of the current problem. Daily consumption of fried food was associated with obesity, and eating fried foods every second day or daily had a PAF of nearly 20%. These health-related behaviors’ underpinning the Thai health transition are associated with increasing obesity. They are modifiable through policies addressing structural issues and with targeted health promotion activities to prevent future obesity gains. Insights into future trends in the Thai health transition can be gained as this student cohort ages.

Folta SC et al. (2009) evaluated community-based intervention designed to reduce cardiovascular disease risk in sedentary midlife and older women who were overweight or obese. In a randomized controlled trial conducted in 8 counties in Arkansas and Kansas, counties were assigned to the intervention (a 12-week twice-weekly heart health program) group or to the delayed-intervention control group. Ten to fifteen women were selected from each site, and participants' weight, waist circumference, diet, physical activity, and self-efficacy were measured. Compared with the control group, participants in the intervention group had a significant decrease in body weight (-2.1 kg; 95% confidence interval
[CI] = -3.2, -1.0), waist circumference (-2.3 in; 95% CI = -4.2, -0.5), and energy intake (-390 kcal/day; 95% CI = -598, -183); an increase in activity (+1637 steps/day; 95% CI = 712, 2562); and an increase in self-efficacy for dietary and physical activity behaviors. Our results suggest that a community-based program can improve self-efficacy, increase physical activity, and decrease energy intake, resulting in decreased waist circumference and body weight among at-risk women.

**Garry R Barton et al. (2009)** estimated the cost effectiveness of four different lifestyle interventions for knee pain. Cost utility analysis of randomized controlled trial. Five general practices in the United Kingdom. 389 adults aged ≥45 with self reported knee pain and body mass index (BMI) ≥28. Dietary intervention plus quadriceps strengthening exercises, dietary intervention, quadriceps strengthening exercises, and leaflet provision. Participants received home visits over a two year period. Incremental cost per quality adjusted life year (QALY) gained over two years from a health service perspective. Advice leaflet was associated with a mean change in cost of −£31, and a mean QALY gain of 0.085. Both strengthening exercises and dietary intervention were more effective (0.090 and 0.133 mean QALY gain, respectively) but were not cost effective. Dietary intervention plus strengthening exercises had a mean cost of £647 and a mean QALY gain of 0.147 and was estimated to have an incremental cost of £10469 per QALY gain (relative to leaflet provision), and a 23.1% probability of being cost effective at a £20 000/QALY threshold. Dietary intervention plus strengthening exercises was estimated to be cost effective for individuals with knee pain, but with a large level of uncertainty.

**Rebecca M. Puhi et al. (2008)** studied employed qualitative methods with a sample of overweight and obese adults to identify and describe their subjective experiences of weight bias. Participants (274 females and 44 males) completed an online battery of self-report questionnaires, including several open-ended questions about weight stigmatization. These questions asked them to describe their worst experiences of weight stigmatization, their perceptions of common
weight-based stereotypes, their feelings about being overweight and their suggestions for strategies to reduce weight stigma in our culture. Participants challenged common weight-based stereotypes (notably, that obese individuals are ‘lazy’) and reported that they would like the public to gain a better understanding of the difficulties of weight loss, the causes of obesity and the emotional consequences of being stigmatized. Education was reported as the most promising avenue for future stigma-reduction efforts. The experiences and opinions expressed were not significantly different for men versus women or overweight versus obese individuals. A minority of participants expressed beliefs suggestive of self-blame and internalization of weight-based stereotypes. These results indicate that while obese individuals experience weight bias across many domains, more stigma-reduction efforts should target stigmatizing encounters in close relationships, including parents, spouses and friends of obese persons.

Sadana et al., 2007 diet surveys are carried out to determine the nutrient adequacy of various population groups. Individual food and nutrient intake help to identify the nutritional problems faced by particular age/sex groups and to educate them to improve their dietaries.

Ying Hua Gao-Balch et al. (2006) studied the theoretical strategy for overweight and obesity, which consists of many factors, is reviewed. As the main theoretical strategy, many intervention programs are known as theory framework; examples of theory framework selection, theory framework with overweight and obesity intervention programs, theory framework to practice example, theory with client, theory with practitioners, theory with disciplines, fit the theory for behavior change, selection theory framework, theory with barriers, theory framework with hypotheses, theory with barriers and theory framework with hypotheses. Theory of framework can apply overweight and obesity intervention across health domains to explore whether efficacy can apply the associated types of interventions with the target populations.
Nutrition education programs are frequently combined with exercise interventions in community health promotion programs. Targeting both physical activity and nutrition can offer a greater number of health promotion opportunities and maximize positive health outcomes for participants (Prochaska & Sallis 2004). Researchers note that exercise and dietary behaviour are influenced by conscious choices (for which increasing health knowledge is useful) and unconscious processes or habits (for which changes in the physical environment is beneficial) (Engbers et al. 2005).

Rena R Wing and Suzanne Phelan (2005) there is a general perception that almost no one succeeds in long-term maintenance of weight loss. However, research has shown that ≈20% of overweight individuals are successful at long-term weight loss when defined as losing at least 10% of initial body weight and maintaining the loss for at least 1 yr. The National Weight Control Registry provides information about the strategies used by successful weight loss maintainers to achieve and maintain long-term weight loss. National Weight Control Registry members have lost an average of 33 kg and maintained the loss for more than 5 y. To maintain their weight loss, members report engaging in high levels of physical activity (≥1 h/d), eating a low-calorie, low-fat diet, eating breakfast regularly, self-monitoring weight, and maintaining a consistent eating pattern across weekdays and weekends. National Weight Control Registry members provide evidence that long-term weight loss maintenance is possible and help identify the specific approaches associated with long-term success.

Evidence of poor assessment and counseling for overweight and obesity has been found in studies evaluating physicians. There was no data found on the frequency and efficacy of assessment and counseling for overweight and obesity by health professionals in adults.

Therefore it will be worthwhile to Assessment of weight reduction in overweight adult people with a combination treatment of electronic devices, diet and physical exercise.