

Increasing Prevalence of Obesity and Role of Exercise

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INTRODUCTION

Modernization has lead to overabundance of foods rich in fats along with decrease in physical activity of people leading to conditions that favour obesity. By definition obesity refers to a condition of accumulation of body fat beyond that considered normal for the age, sex and body type of a given individual. Obesity is one of the major health problems in the modern society and its association with a number of health conditions including coronary heart disease, diabetes mellitus, hypertension and colon cancer etc. is well established. Obesity is considered a complex medical problem and may have a multitude of causes, such as genetic, hormonal imbalances or impaired metabolism etc that predispose individuals to obesity. In addition to these causes, environmental factors like consumption of fattening foods and low levels of physical activity add to the complexity of the problem.

There seems to be a strong genetic basis behind severe cases of obesity and often begin during childhood or during the beginning of adolescence. During this time, fat cells rapidly increase in number in obese children and make it hyperplastic in nature. The treatment of this type of obesity becomes difficult as the ability of the adipose storage tissue to accumulate fat increase due to increase in the number of fat cells. In such cases of obesity, medical intervention including use of surgery, drugs etc., sometimes may become necessary. Most individuals although do not have a predisposition to obesity, but may still become overweight. Obesity in them gradually sneaks up due to lifestyle changes like increased food intake and low levels of physical activity. In this type of obesity (also termed as creeping obesity), the fat cells appear to increase in size rather than in number. Health fitness professionals feel that programs to control creeping obesity have greater chances of success than hyperplastic obesity, because many of the environmental factors that contributes to the development of creeping obesity can be effectively modified.

Although fat percentage approach is recognized as the best method to assess obesity, but it is difficult to measure it when conducting stud-

ies on large populations. Therefore many investigators use height and weight measures to assess the extent of deviation in body weight relative to ones height (Weigley, 1984; Simopoulos, 1985, 1986; Abraham, 1988). Relative body weight uses the ratio of actual weight to desirable weight. Obesity as per this approach is defined as being 20% or more overweight. Height-Weight tables only provide a rough estimate of ones ideal body weight while Quetlet Index (kg/m^2) also referred to as Body Mass Index (BMI), on the other hand offers a higher correlation with actual body composition. Studies conducted by Revicki and Israel (1986) and Smalley et al. (1990) have shown that Quetlet Index correlates rather well ($r=0.70$) with actual measurement of body fat as assessed from hydrostatic weighing, making it a useful tool in large population studies on obesity.

A REVIEW OF SOME CLASSICAL STUDIES ON OBESITY

- (i) Prevalence of Obesity
- (ii) Obesity and its Association with Health Problems
- (iii) Physical Activity, Obesity and weight control

(i) Prevalence of Obesity

Recent estimates suggest that more than 30% of adults and about 25% of adolescents and children in the United States are carrying too much body fat for optimal health. Kuczmarski et al. (1994) in a compilation of National Health and Nutrition Examination Surveys conducted in USA from 1960-1991 report that obesity affects 58 million adults between the ages of 20-74 years, with the highest rates among poor and minority groups. Figure 1 presents the comparison of current overweight figures with the earlier data collected during the 1960's (Kuczmarski, 1992; Piani and Schoenborn, 1993; Williamson, 1993). The results demonstrate significant increases in overweight figures from 1960 to 1991 in all segments of the American society. Further among the various sections of American society, Black women exhibit higher prevalence of overweight than their

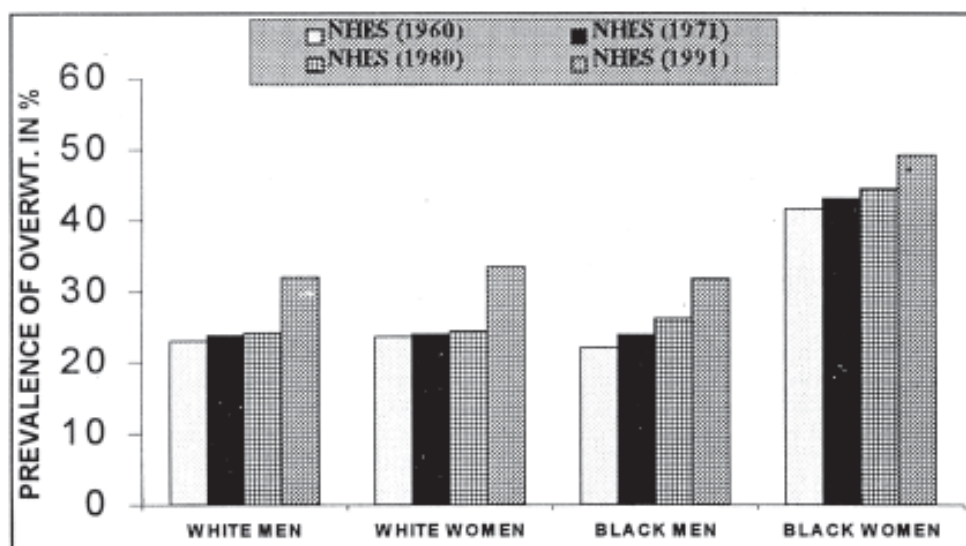


Fig. 1. Overweight trends in US adults from 1960-1991

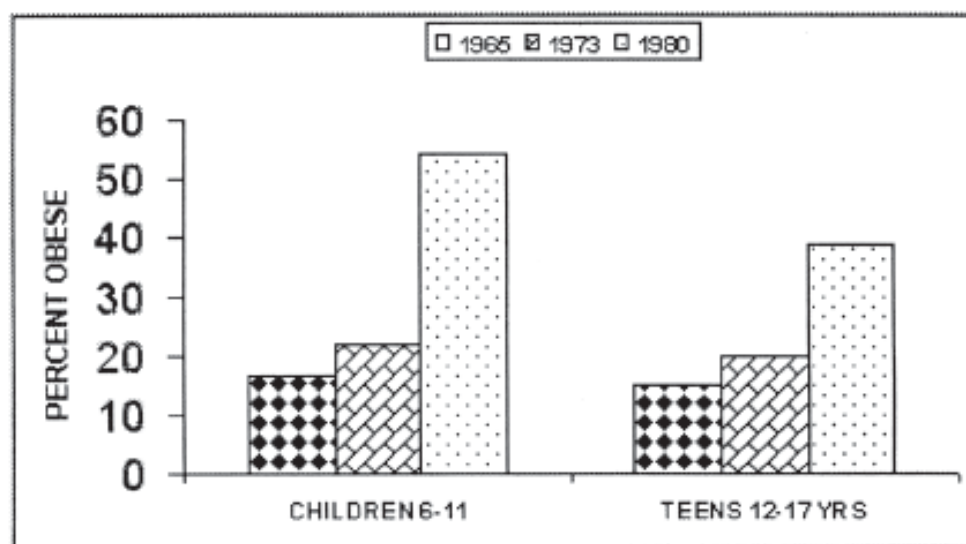


Fig. 2. Prevalence of obesity among US children

White counterparts. Comparison of various populations of the world, reveal that Americans are among the heaviest people in the world (Millar and Stephens, 1987; Laurier et al., 1992).

A comparison of reports on American children and youth 6-17 years of age from 1965 to 1980 also reveal a continuous increasing trend in obesity (Gortmaker et al., 1987 and Ross et

al., 1987). An increase of 54% and 39% is observed in the obesity figures in 6-11 year children and teenagers (12-17 years) when comparison is made between corresponding figures reported in children in 1980 and 1965 respectively (Fig. 2). Another important observation indicates that prevalence of obesity is lower in teenagers as compared to children.

Verma and Mokha (2000) in a survey of 446

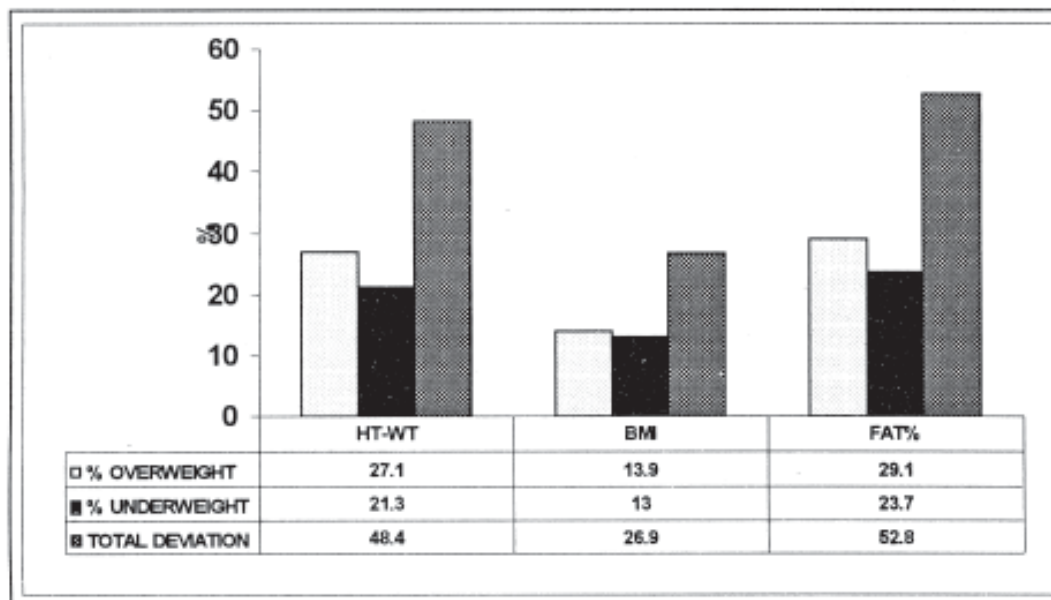


Fig. 3. Weight trends in adult Punjabi Males

adult males reported that almost 50% of the Punjabi youth show deviations from the normal range of body weight for their respective heights as revealed by the application of two most widely practised approaches (Figs. 3, 4). Overweight individuals in their total sample have been observed to contribute relatively more than the underweight subjects to the total deviation from normalcy. The observation is indeed startling and raises questions about the different facets related to the health, lifestyle and fitness of

Punjabi youth and needs interpretation in the light of improved nutrition and increased sedentariness in the society.

Magnitude of excess body weight is not that alarming in this age group as is the incidence of occurrence of overweight that has been found to be 29.1% as per fat% approach. A change in the lifestyle of Punjabi youth towards a positive one is visualized to be the solution for reducing the incidence of occurrence of overweight. Awareness among the Punjabi youth regarding

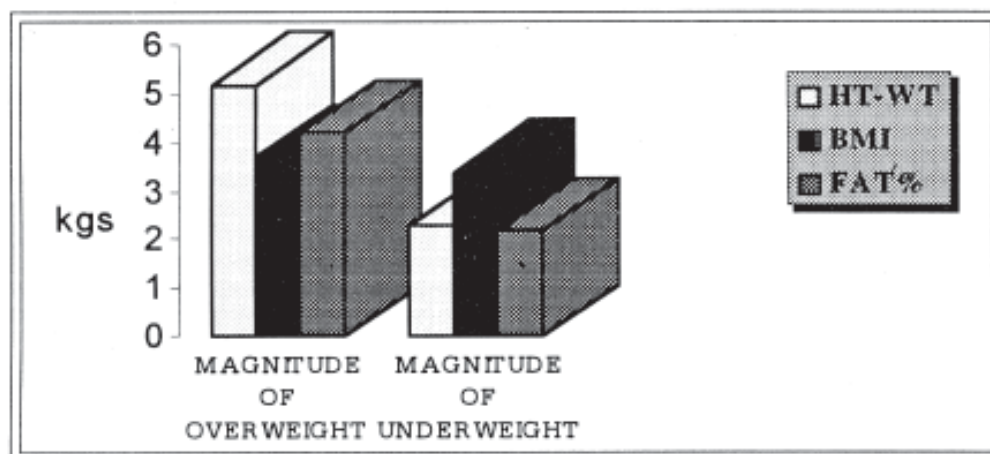


Fig. 4. Magnitude of over/under weight as per different approaches

methods of losing fat and gaining muscles based on scientific principles is needed to check this problem.

(ii) Obesity and Its Association with Health Problems

Although several studies have proved association of large number of health problems with obesity, however, it was only in 1985 that the health hazards of overweight/obesity were first officially recognized by the National Institutes of Health in USA. Risk of developing hypertension has been reported to be three times more among obese as it is among the normal-weight people. (Clarke et al., 1986; Hubert et al., 1987; Smoak et al., 1987 and Wittman et al., 1989). It is evident from figure 5 that the risk of developing hypertension rises strongly with increase in BMI.

Another health problem, which obese people face, is the disturbed lipid profile. Several investigators have reported higher blood cholesterol, triglyceride and low-density lipoprotein levels and lower high-density lipoprotein concentration among obese people (Dattilo and Kris-Etherton, 1992; Denke et al., 1993). Figure 6 clearly indicates that the ratio of total cholesterol to HDL-C increases with increase in obesity as indicated by BMI values.

Figure 7 depicts the mortality risk according to Body Mass Index in a 26-year study of 8828 nonsmoking and nondrinking males conducted by Lindsted et al. (1991). According to this study minimum mortality has been observed in lower BMI groups and mortality risk increase in higher BMI groups. In other words the lean people exhibit lowest mortality rates. Higher incidence of hypertension and disturbed lipid profile in obese people make them more prone

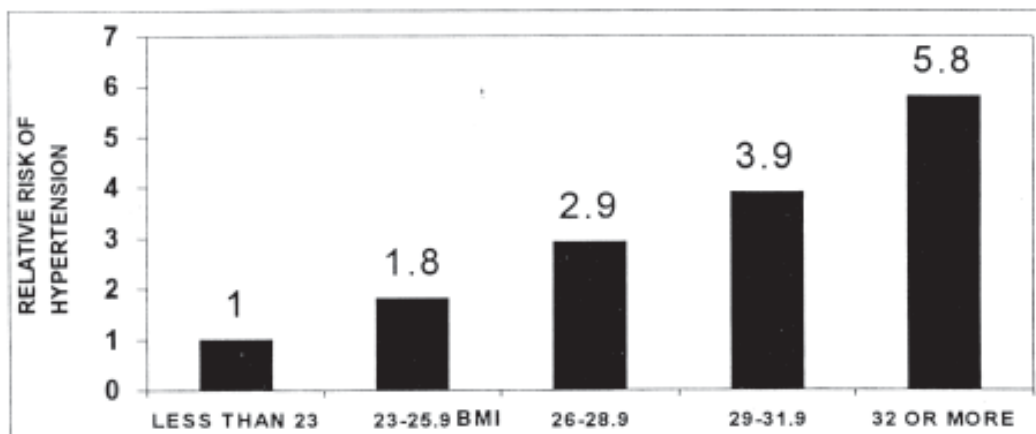


Fig. 5. BMI and Risk of Developing Hypertension

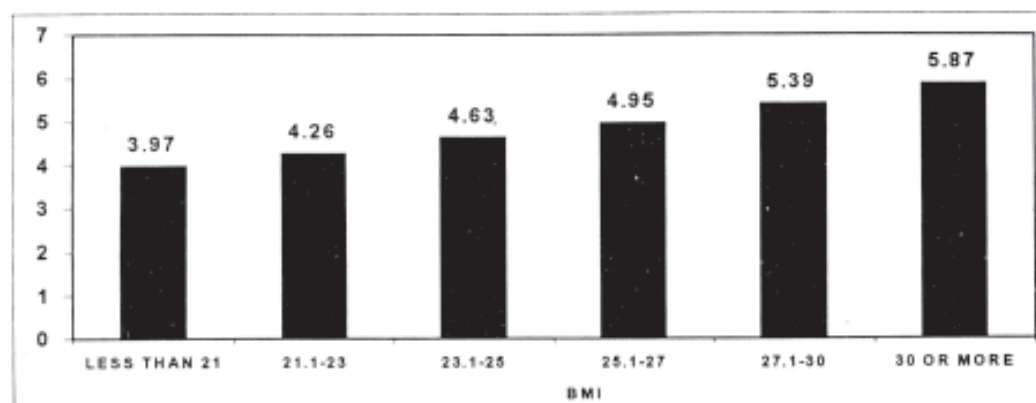


Fig. 6. Total /HDL Ratio by BMI

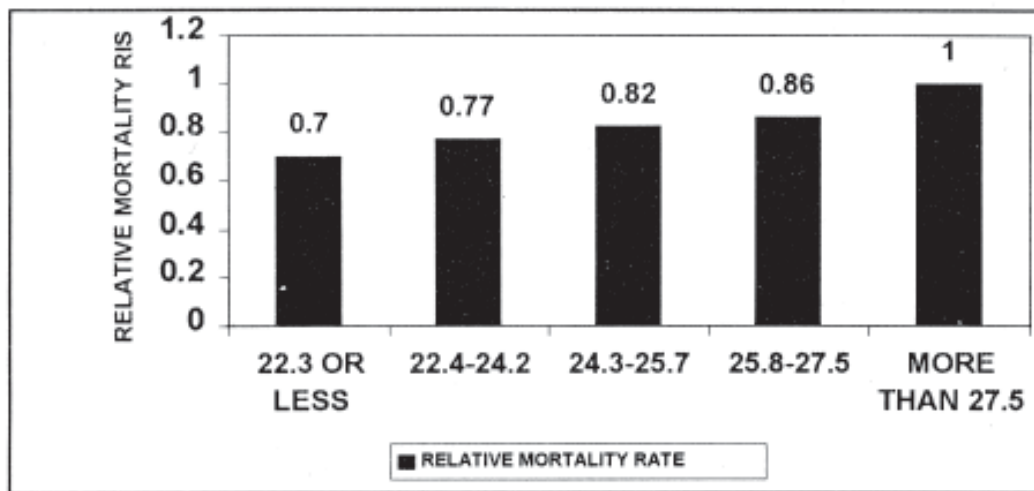


Fig. 7. Mortality risk according to BMI

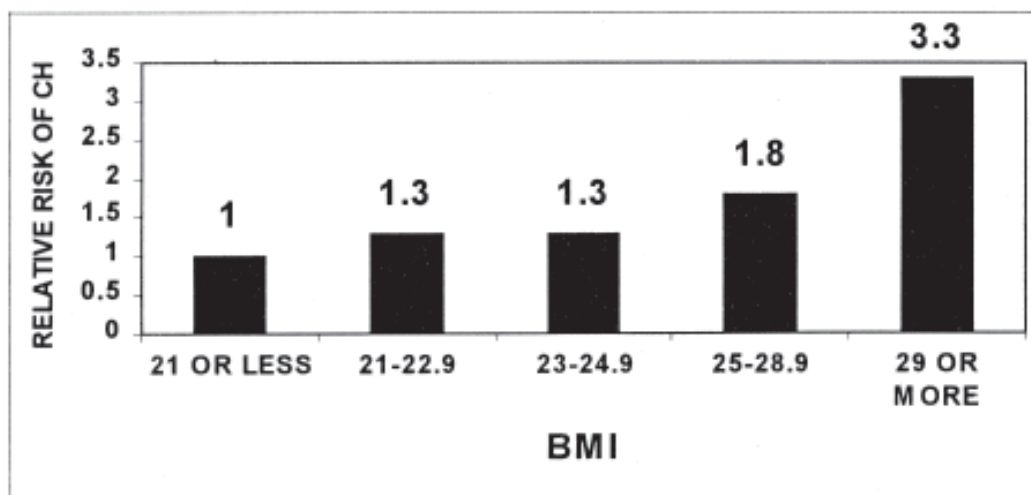


Fig. 8. BMI and heart disease risk

to suffer from various heart diseases and as a result, they are more likely to die from it at a higher rate than the normal non-obese counterparts (Hamm et al., 1989; Manson et al., 1990; Pi-Sunyer, 1993). Manson et al. (1990) in a 8 year study on over 115,000 Nurses, reported that the risk of developing coronary heart disease more than tripled in those with a BMI greater than 29 against those with BMI less than 21 (Fig. 8)

Obesity in addition to the above mentioned health risks also makes the individual prone to diabetes and cancer (Simopoulos, 1987).

(iii) Physical Activity, Obesity and Weight Control

Human body is basically designed for physical activity. Modern technological advancements have deprived many of the opportunities they once had to incorporate moderate physical activity as a natural part of their lives. On the food intake front on the other hand, an increase is witnessed. Hence, the combination of overeating and physical inactivity has led to increasing levels of overweight and obesity. An average sedentary individual usually spends only

300-800 Calories/day in physical activity of informal and unplanned nature. Top athletes on the other hand, spend large amounts of energy that usually equals their resting metabolic rate energy expenditure.

Obesity does appear overnight and is a slow process, which results from accumulation of an extra caloric intake per day that over a passage of time leads to excess fat tissue. It is therefore believed that accounting of these extra calories through daily exercise program could easily counteract the effect of these extra calories. For maintaining optimal health and fitness, most experts recommend burning of at least 200-400 Calories/day through planned exercise.

Many investigators have reported that obese children and adults are relatively less active than normal weight persons (Chirico and Stunkard, 1960; Bullen et al., 1964; Bloom and Eidex, 1967; Stunkard, 1984; Dietz and Gortmaker, 1985; Pacy et al., 1986; Tucker, 1986; de Boer et al., 1987; Tryon, 1987; Park, 1992; Tucker and Bagwell, 1991; Tryon et al., 1992; Stefanick, 1993). According to Bullen et al. (1964) obese children spend about 40% less time in physical activity than their lean counterparts. Chirico and Stunkard (1960) reported that obese men and women, on an average, walk 2-4 miles less/day than their normal weight peers. Similarly Bloom and Eidex (1967) observed that obese people stay in bed longer, and spend about 17% less time on their feet, than normal weight people. In nutshell, there is a strong evidence to suggest that physical activity decreases in direct relationship to the degree of obesity (Tryon et al., 1992). Although review of various studies related to obesity and physical activity suggest a tendency of less physical activity for obese people than people of normal weight, but these studies simultaneously suggest no apparent difference in total energy expenditure between the two groups. This is because obese people are heavier and thus expend more Calories during physical activity. Thus inspite of the fact that obese people tend to engage themselves in less physical activity than the normal weight persons, the net daily energy expenditure from physical activity has been reported in many studies to be comparable (Ravussin et al., 1986; Blair and Buskirk, 1987). Keeping in view this fact, most experts lay more emphasis on controlling the overeating in obese to achieve optimal body weight. It must be kept in mind that this assertion does not undermine the importance of physical activity for obese as studies have established be-

yond doubt that physical activity is necessary for the overall success of any weight control program. Researchers believe that any program designed to treat obesity must incorporate the three elements namely diet, exercise and behaviour modification to attain a long-term weight control (Stunkard, 1987; Brolin, 1992; Hill et al., 1993). According to Jequier (1987), a weight loss of 1% of total body weight/week is optimal for most obese individuals. For example, a person weighing 100 kgs should aim to lose no more than 1 kg a week. As each kg of body fat is equivalent to 7700 Calories, therefore a Calorie deficit of 1100 Calories/day is needed to be produced in order to achieve a weight loss of one kg in one week. This can be accomplished by increasing energy expenditure through physical activity by 300 to 400 Calories a day and reducing dietary fat intake by 700 to 800 Calories. Some researchers are of the opinion that in order to lose weight, mainly in the form of fat, caloric manipulation should be done in the ratio of 1:1, that is 50% of the calculated daily Calorie deficit should be achieved by increasing energy expenditure and another 50% by reducing dietary fat intake (Verma and Mokha, 1999). Most of the obese patients can derive benefits by following these guidelines. However, for moderate to severely obese persons, additional therapy comprising of Very Low Calorie Diet (VLCD) and/or gastric reduction surgery under medical supervision is required to deal with the problem (Gray, 1992).

It is generally believed that physical activity plays an important role in promoting weight loss, but the fact is just the opposite as revealed by many studies (Van Dale et al., 1987; Donnelly et al., 1991; Calles-Escandon and Horton, 1992; Phinney, 1992; Saris, 1993). These studies have rated control of caloric intake as a much more powerful tool than exercise in weight loss programs. King et al. (1991) reported no significant effect on body weight in a one-year study on 160 females and 197 males doing three to five 30 to 40 minute exercise sessions. Hardman et al. (1992) also reported no change in body weight or fat in case of walkers averaging 157 minutes of brisk walking per week for one year and sedentary controls. Keeping in view the general belief that people indulging in exercise may start eating more, negating the increased energy expenditure of exercise, many investigators have reported the effect of exercise under controlled dietary conditions.

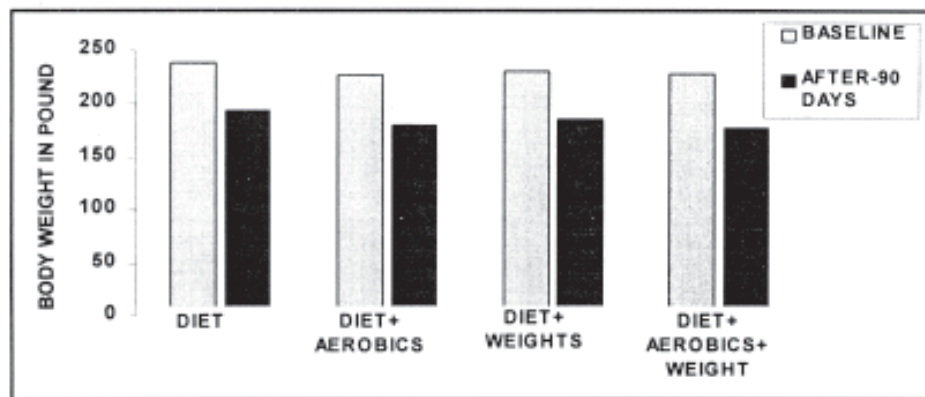


Fig. 9. Effect of various types of exercises on weight loss during dieting

Figure 9 shows the results of a 90-day study conducted by Donnelly et al. (1991) on 69 moderately obese females on a 520 Calories/day diet. They divided their subjects into four groups that is diet only, diet + aerobic training, diet + weight training and diet + aerobic + weight training. The results of their study indicate that each group lost 45 to 50 pounds of body weight after three months, thus revealing no significant impact on weight loss. Nieman et al. (1988) also carry the same opinion and describe the common belief that aerobic exercise in combination with reducing diet in obese people promotes weight loss as a misconception.

Another common belief that exercise leads to elevation of the resting metabolic rate for long time after the cessation of exercise has been subjected to scientific testing by many researchers. The results of such studies in general, reveal that energy expended after aerobic exercise is small unless a person engages himself in

a high intensity aerobic effort (Brehm and Gutin, 1986; Brehm, 1988; Sedlock et al., 1989; Bahr and Sjersted, 1991; Sedlock, 1991; Withers et al., 1991; Bahr et al., 1992 and Blair, 1993;). Brehm and Gutin (1986) and Sedlock et al. (1989) tested subjects at different intensities of work loads and measured the time for which their RMR remained elevated and the amount of extra calories burned following 14 hours of post exercise period. The results of their study have been depicted in figures 10 and 11. It is evident from these figures that amount of caloric expenditure following exercise is too little to have any significant effect on body weight loss. More so, most obese persons are incapable of performing intense workouts that can keep the post exercise RMR elevated for long time. Therefore, it is a misconception that exercise causes the RMR to stay elevated in obese persons for a long time after the exercise bout and help them to burn extra calories.

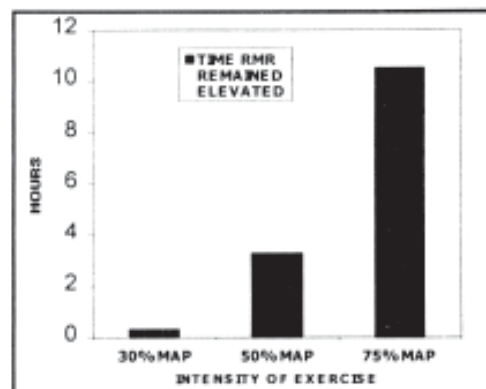


Fig. 10. Effect of intensity of exercise on post exercise RMR elevation

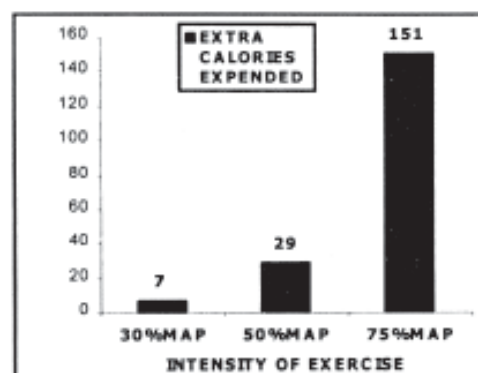


Fig. 11. Effect of different intensities of exercise on post exercise caloric expenditure

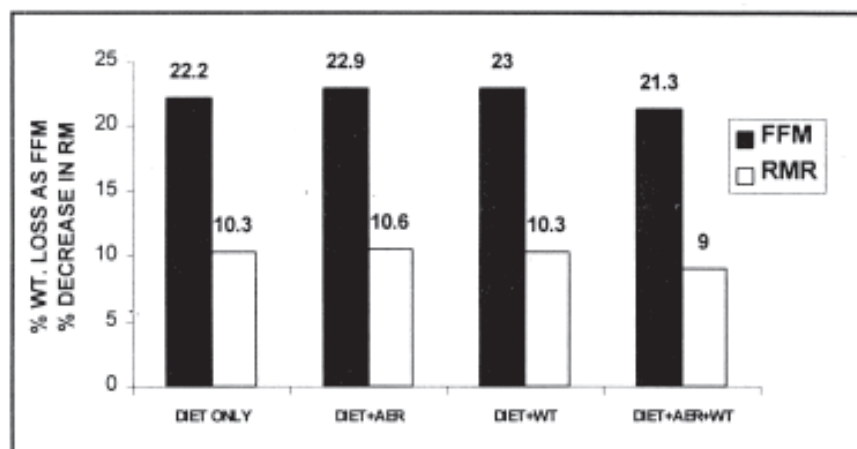


Fig. 12. Effect of different types of exercises on the diet induced decrease in RMR

It is well established that decreased caloric intake causes drop in the RMR, which relates directly to the magnitude of caloric restriction and rate of weight loss. Many people generally believe that exercise counters this diet induced decrease in RMR. The results of most of the studies do not support it and are contrary to this belief (Mathieson et al., 1986; Henson et al., 1987; Donnelly et al., 1991; Phinney, 1992; Saris, 1993). Figure 12 depicts the results of a study conducted by Donnelly et al. (1991) that indicate lack of any effect on the drop in RMR with aerobic or resistive training in subjects on 520-Calorie/day diet. In addition to this, it must be noted that the magnitude of decrease in fat free mass (FFM) in all the four groups is almost equal. Donnelly et al. (1991) further reported that magnitude of loss of weight from fat free compartment depends on the degree of caloric deprivation. Greater the caloric restriction, greater is the loss of fat free mass.

Based on the review of studies related to physical activity and obesity, it appears that exercise has little role to play in promoting weight loss in obese persons. In spite of the weak role played by exercise in weight loss endeavors, it offers a great potential on the health and fitness front for the obese population. These benefits include improved cardio respiratory fitness, markedly improved blood lipid and psychological profiles. All these benefits enhance long-term maintenance of weight loss along with decrease the risk of contracting obesity related diseases. Therefore it can be concluded that the success of any weight loss program should be monitored not only by the total amount of weight lost but

also by the quality of the weight loss and health status.

KEY WORDS Physical Activity. Body Fat. Body Type. Age. Sex. Diseases

ABSTRACT Health fitness professionals feel that programs to control creeping obesity, because many of environmental factors that contributes to the development of creeping obesity can be effectively modified. In this paper an attempt has been made to evaluate increasing prevalence of obesity and role of exercise.

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