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RESEARCH ARTICLE

EFFECT OF DIETARY CONSTITUENTS ON THE WEIGHT OF ALBINO RATS

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ABSTRACT

Background: A positive relation between high fat diet and obesity is well documented. The amount of total energy required by an organism derived from each component of diet affects the weight. But if the total calories in diet of an experimental animal is constant (isocaloric) irrespective of its constituents, it is least likely to increase the weight of these animals. The present study was done to observe the effects of isocaloric diet with different percentage of the constituent components on the weight of Albino rats. **Methods**: The present study was done for a period of 24 weeks. Thirty male albino rats taken for this study were randomly divided into three groups A, B and C with 10 rats in each group. Group A rats served as control and were fed on low fat diet consisting of chow containing 2.5 percent of fat. Group B rats were fed on isocaloric but high fat diet (30% of total calories were derived from animal fat). Group C rats were fed on high caloric high fat diet. The mean weight of these animals was taken at the beginning and at the end of this study. **Results:** The mean weight of animals fed on isoclaoric diet irrespective of its components was same. The animals fed on high fat high calorie diet gained more weight. **Conclusions:** The results of this study show that isocaloric diet irrespective of its components (high fat verses low fat) does not affect the weight of Albino rats. It is the total number of calories irrespective of dietary components that results in weight gain of Albino rats.

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INTRODUCTION

Fat is an important constituent of our diet and an important source of energy. Excess of animal fat in diet is not considered good for health as it leads to obesity. The aim of our present study was to observe whether excess weight and obesity is caused by increased percentage of fat(greater than 30 percent) in diet or it is due to excess amount of calories taken by these animals. Three main energy yielding components of our diet are carbohydrates, proteins and fats. These nutrients are concerned primarily with Body growth, development and maintenance (Reuter, 2007; Brunt, 1999). Foods are composed chiefly of carbohydrates, fats, proteins, water, vitamins, and minerals. Carbohydrates, fats, proteins, and water represent virtually all the weight of food, with vitamins and minerals making up only a small percentage of the weight. Carbohydrates, fats, and proteins comprise ninety percent of the dry weight of foods 12 (Cotran, 2005). They supply energy at the following rates

Proteins - 4kcal/gram (or) 17kj
Fats -9kcal/gram (or) 13kj
Carbohydrates - 4kcal/gram.

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Balanced diet provides 2500 kcal of energy to man and 2000kcal to female/day. These values vary depending on age, metabolism and level of physical activity. Percentage of daily energy intake (Abdel-Misih, 2010) in a balanced diet is; carbohydrates - 50-65%, Proteins -15-20%, Fat - 15-20%.The daily energy requirement of an adult albino rats varies from 150 -225 Kcal/kg body weight (http://emedicine. medscape.com/article/1900159-over). Obesity is a known risk factor for many Diseases like hypertension, type 2 diabetes, and some malignancies (World Health Organization, 2005). Its prevalence is increasing day by day. Genetics has a definite role in regulating body size, weight, composition and the metabolic response to feeding in humans (Ichihara, 2008) and animals (Reuter, 2007; Speakman, 2007) .The increase in weight of an individual over short periods cannot be explained on the basis of Genetics. The susceptibility of an individual to obesity as result of environmental factors like diet varies from individual to individual (Cotran, 2005; Ichihara, 2008; DeCastro, 2004; Mart´ınez-Hernandez, 2007; Reuter, 2007). The available reports in literature suggest that dietary fat is responsible for induction of obesity in humans and animals. Reports from human studies suggest that high fat diet obtaining greater than 30%ofenergyfromfat can easily induce obesity (Jequier, 2002; Hill, 2000; French, 2003; Bray, 1998; Schrauwen, 2000). Many studies have shown that with increase in the average amount of fat in diet, the incidence of obesity also increases (20–23).

This has led to a worldwide sensitization to decrease the amount of fat in the human diet. High fat diets induce obesity inhumans and animals (Rothwell, 1984; Buettner, 2007; Warwick, 1992).

MATERIALS AND METHODS

The present study was done for a period of 24 weeks. Thirty male albino rats taken for this study were randomly divided into four groups A, B and C with 10 rats in each group. Group A rats served as control and were fed on low fat diet consisting of chow containing 2.5 percent of fat. Group B rats were fed on isocaloric but high fat diet (30% of total calories were derived from animal fat). Group C rats were fed on high caloric high fat diet. The mean weight of these animals was taken at the beginning and at the end of this study.

Aims and objectives

- To observe the effect high fat isocaloric diet on the weight of albino Rats.
- To study the effect of high fat high caloric diet on the weight of Albino rats.
- To compare the effect of isocaloric diet with different dietary constituents on the weight of Albino rats.

RESULTS

The results of this study show that there was no significant difference in the weight of albino rats which were fed on isocaloric diet whether it was high fat containing greater than 30 percent of fat or low fat with only 2-3 percent of fat. The albino rats fed on high fat and high caloric diet (diet containing greater than 30% of animal fat and more calories than iso caloric diet) significantly gained more weight.

DISCUSSION

A positive relationship exists between fat in diet and weight gain of experimental animals like rats (27,28)and mice(29,30). There is a lot of available literature suggesting that rats consuming high fat diet gained weight faster than those fed on low fat diets (31,32). In1949,ad libitum was used to induce obesity in rats. Fenton &Dowling (1953)33usedhigh-fatdiets with fat providing more than 50% of total energy to induce obesity in rats. This type fat induced obesity was initially called nutritional and later on dietary obesity(34,35).Studies using high-carbohydrate–low-fat diets have not been found as efficient as high-fat–low- carbohydrate diets in inducing dietary obesity(28). Earlier worker have done many human studies to observe the effect of diet especially fat on the weight and obesity (32-34) but most of the studies on obesity have been done using animal models (11,39,40).The observations made in our present study are similar to those made by earlier workers (27,29,35, 39,40) who found that high fat diet induces obesity in experimental animals. Kuzo et al (1970) in their study divided 135 male Wistar albino rats in to three groups normal, high fat, and high protein group. The study was carried for 400 days. They found that high fat diet (>48% of fat) resulted in weight gain of these experimental animals more than the same animals that were fed on high protein or carbohydrate diet. They also found that high fat diet resulted in impaired carbohydrate metabolism in Wistar Albino rats.

In contrast in our study one group of experimental animals was put on high fat diet (Containing greater than 30 percent of animal fat) whereas other group was give normal diet containing less than 3 per cent fat, but both the diets were iso caloric. At the end of this study we observed no significant differences in the weight of the two groups. In other words it means that it is the total calories rather than constituents that determine the weight of experimental animals. Thus the observations made in our study are discordant with those made by earlier workers.

Hill Joi et al. (1992) conducted a study to examine long-term effects of amount and type of dietary fat on body weight and body composition. Adult male Wistar rats were fed high fat or low-fat diets for 28 weeks. Half of the rats in each condition received diets with saturated fat (lard) (S) and the remainder received diet with polyunsaturated fat (corn oil) (U). From 28-39 weeks, HF rats were switched to LF diets (fat type remained constant). From 40-50 weeks, previously HF fed rats were matched to rats in the LF fed groups. HF rats became fatter than LF rats during weeks 1-28 and remained heavier and fatter from weeks 28-39.

During weeks 1-28, type of dietary fat had no effect on total body fat in either HF or LF rats, but during period 2 (weeks 28-39), U rats were heavier and fatter than S rats. There was some indication that U diets were associated with greater accumulation of fat in subcutaneous adipose tissue depots than S diets. From 40-50 weeks, rats previously fed HF diet required less food to maintain their body weight than did LF diet rats. Thus, these results suggested that although both amount and type of dietary fat can affect body weight and body composition, the effects of the type of fat are less than those of amount of dietary fat. Thus the observations made in our study are concordant to the above study.

Summary and Conclusion

The amount of total energy required by an organism derived from individual components of diet affect the weight of animals. But if the total calories in diet of an experimental animal is constant (isocaloric) irrespective of its constituents, it is least likely to increase the weight of these animals. The present study was done to observe the effects of isocaloric diet with different constituent components on the weight of Albino rats. In this study we found that it is the total calories rather than constituents that affect the weight of experimental animals.

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