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RESEARCH ARTICLE

USEFULNESS OF GYMNASIUMS IN CONTROLLING OBESITY IN CENTRAL INDIAN POPULATION

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ABSTRACT

A vertical study was conducted on 41 subjects, who were otherwise healthy except that their BMI was greater than 30.0. All the subjects were regular gym visitors, exercising for one hour a day, for average five days a week. 3 records of their body parameters were taken to calculate their BMI. First set of record was taken before the beginning of gym exercise, second after 3 months of exercise and third 3 months after the cessation of exercise. Results shown that exercise reduces the body weight and consequently obesity, but both of these are not maintained without exercise.

Key words:

Body Mass Index, overweight,
obesity, leptin

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INTRODUCTION

Obesity is a complex disorder involving an excessive amount of body fat. Obesity isn't just a cosmetic concern. It also increases the health problems such as heart disease, diabetes and high blood pressure.

The good news is that even modest weight loss can improve or prevent the health problems associated with obesity. Dietary changes, increased physical activity and behavior changes can help to lose weight.

As per WHO

- Worldwide obesity has more than doubled since 1980.
- In 2014, more than 1.9 billion adults are under 18 years and older were overweight. Of these over 600 million were obese.
- 39% of adults aged 18 years and above were overweight in 2014, and 13% were obese.
- 11% of men and 15% of women were obese in 2014.

- Most of the world's population lives in countries where overweight and obesity kills more people than underweight.
- 42 million children under the age of 5 were overweight or obese in 2013.
- Obesity is preventable.

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been:

- an increased intake of energy-dense foods that are high in fat; and
- an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization.

Changes in dietary and physical activity patterns are often the result of environmental and societal changes associated with development and lack of supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing and education.

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Raised BMI is a major risk factor for non-communicable diseases such as:

- cardiovascular diseases (mainly heart disease and stroke), which were the leading cause of death in 2012;
- diabetes;
- musculoskeletal disorders (especially osteoarthritis - a highly disabling degenerative disease of the joints);
- some cancers (endometrial, breast, and colon).
- The risk for these non-communicable diseases increases, due to increase in BMI.

Obesity is stigmatized in much of the modern world (particularly in the Western world), though it was widely seen as a symbol of wealth and fertility at other times in history and still is in some parts of the world.

Dieting and exercising are the main treatments for obesity. Diet quality can be improved by reducing the consumption of energy-dense foods, which are high in fat and sugars, and by increasing the intake of dietary fiber. With a suitable diet, anti-obesity drugs may be taken to reduce appetite or decrease fat absorption. If diet, exercise, and medication are not effective, a gastric balloon may assist with weight loss, or surgery may be performed to reduce stomach volume and/or bowel length.

Obesity is a medical condition in which excess body fat has accumulated to the extent ^[1] It is defined by body mass index (BMI) and further evaluated in terms of fat distribution via the waist-hip ratio. BMI is closely related to both percentage body fat and total body fat.

BMI is calculated by the subject's weight divided by the square of their height

$$BMI = \frac{m}{h^2},$$

This definition is established by the World Health Organization (WHO) in 1997 and published in 2000. The values listed in the table below

BMI (kg/m ²)		Classification
from	up to	
	18.5	underweight
18.5	25.0	normal weight
25.0	30.0	overweight
30.0	35.0	class I obesity
35.0	40.0	class II obesity
40.0		class III obesity

where *m* and *h* are the subject's weight and height respectively. Hence, the aim of the present study usefulness of gyanisum in controlling Obesity in central indian population.

MATERIALS AND METHODS

1. Selection of subjects: Study was conducted on 41 suitable subjects, selected from various gymnasiums of Bhopal, who had taken quarterly membership. Subjects were 21 males and 20 females, of age group 25 – 40 years, exclusion critiria ,healthy individuals with no

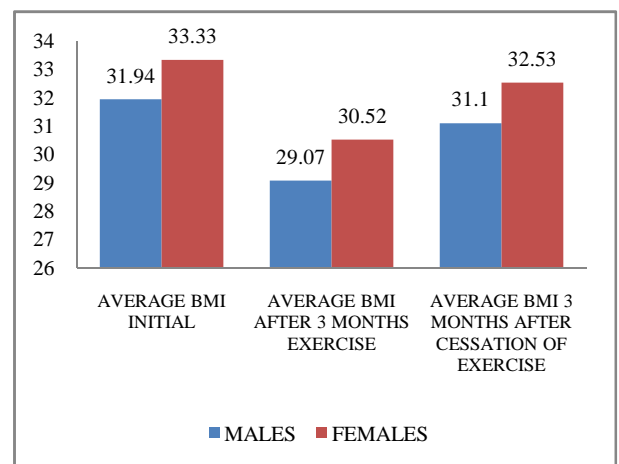
history of Diabetes mellitus, Hypertension, Cardiac or thyroid disorders. All of these were sedentary workers, working for 8 – 12 hours a day or housewives. They were belonging to middle income group, literate and conscious about their health. Subjects were not a professional sports person or exerciser previously. Subjects were informed about the study and written consent was taken. Subjects were examined clinically for any major illness. Subjects were not following any dietary restriction.

2. Body parameters for calculation of BMI (Body Mass Index), which are Height in centimeters and weight in meters was determined by measuring tape and electronic personal weighing scale sensitive up to 0.1 kilogram. Weight recording was done with light clothes and without shoes. Subjects having BMI greater than 30.0 were studied. All the selected subjects were doing various gym exercises for about 1.0 hour a day for about 5 days in a week.
3. Body parameters were recorded before the commencement of exercise, after the completion of 3 months of exercise and 3 months after the stoppage of exercise.
4. BMI of the subjects was calculated and compared.

RESULTS

Observations recorded from this study were analyzed

Subjects	Average bmi initial	Average bmi after 3 months exercise	Average bmi 3 months after cessation of exercise
Males	31.94	29.07	31.10
Females	33.33	30.52	32.53



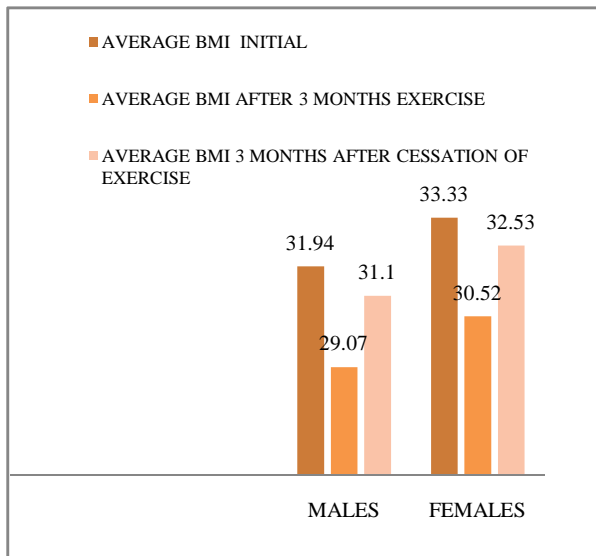
In the presence study average BMI after 3 months exercise shows better result in reducing the obesity.

In this bar diagram shows obesity is more in females than male in this study

DISCUSSION

Obesity is excess fat accumulated in the body. It will reduced life expectancy and increases the health problems.(WHO200,)

The two factors that affect the amount of adipose tissue in the body are energy expenditure and energy intake.



Energy expenditure occurs as a result of basal metabolic rate, the thermic effect of food, and muscular activity. At present there is no convincing evidence that these two factors are significantly different in lean or obese individuals at their usual weights. (Haslam DW *et al*,2005)

At an individual level, a combination of excessive food energy intake and a lack of physical activity is thought to explain most cases of obesity. (Lau DC *et al* 2007) A limited number of cases are primarily due to genetics, medical reasons, or psychiatric illness. (Bleich S *et al* 2008) In contrast, increasing rates of obesity at a societal level are due to easily accessible and palatable diet. (Drewnowski A,*et al*,2004)

From 1971 to 2000, an increase has occurred due to average amount of food energy consumed. For women, the average was increased 335 calories (1,400 kJ) per day, 1,542 calories (6,450 kJ) in 1971 and 1,877 calories (7,850 kJ) in 2004, while for men the average increase was 168 calories (700 kJ) per day 2,450 calories (10,300 kJ) in 1971 and 2,618 calories (10,950 kJ) in 2004. Most of this extra food energy came from an increase in carbohydrate consumption rather than fat consumption. (Wright Jd, *et al*,2004) The primary sources of these extra carbohydrates are sweetened beverages, which have 25 percent of daily food energy in young adults in America, (Caballero B, 2007, Mozaffarian D *et al*,2011) Consumption of sweet drinks such as soft drinks, fruit drinks, iced tea, and energy drink and vitamin water drinks is believed to be contributing to the rising rates of obesity, (Malik VS, *et al*,2006, Olsen NJ *et al*,2009) increased risk of metabolic syndrome and type 2 diabetes. (Malik VS, *et al*,2010)

As societies become increasingly reliant on energy-dense, big- portions, and fast-food meals, the association between fast-food consumption and obesity becomes more concerning. (Rose alnheck R *et al*,2008) In the United State consumption of fast-food meals tripled and food energy intake from these meals quadrupled between 1977 and 1995. (Lin BH,*et al*,1999)

A sedentary lifestyle plays a significant role in obesity. (Seidell 2005) Worldwide there has been a large shift towards less physically demanding work, (WHO,2008) and currently at least 30% of the world's population gets insufficient exercise. (Ness- Abramof R, *et al*,2006) This is primarily due to increasing use of mechanized transportation and a greater prevalence of labour-saving technology in the home. (WHO,2009)

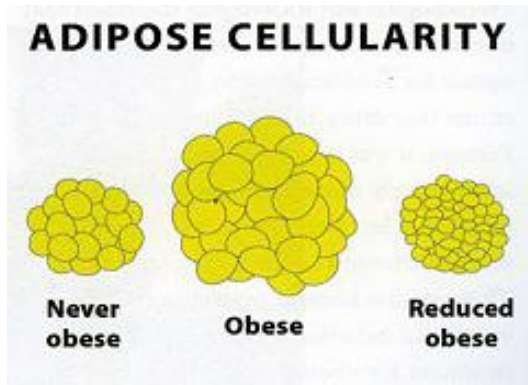
Obesity increases the likelihood of various diseases, particularly heart disease, type 2 diabetes, obstructive sleep apnea, certain types of cancer, and osteoarthritis. (Haslam DW, *et al*,2005) Obesity is most commonly caused by a combination of excessive food energy intake, lack of physical activity, and genetic susceptibility, although a few cases are caused primarily by genes, endocrine disorders, medications, or psychiatric illness. Evidence to support the view that some obese people eat little yet gain weight due to a slow metabolism. On average, obese people have greater energy expenditure than their thin counterparts due to the energy required to maintain an increased body mass. (Kushner *et al*,2007, Adams JP *et al*,2000) BMI is further evaluated in terms of fat distribution via the waist-hip ratio and is closely related to both percentage body fat and total body fat. (Gray DS, *et al*, 1991)

Leptin (from Greek *leptos*, "thin"), the "satiety hormone", is a hormone made by adipose cells that helps to regulate energy balance by inhibiting hunger. Leptin is opposed by the actions of the hormone ghrelin, the "hunger hormone". Both hormones act on receptors in the arcuate nucleus of the hypothalamus to regulate appetite in order to achieve energy homeostasis. (Brennan AM, *et al*, 2006) In obesity, a decreased sensitivity to leptin occurs, resulting in an inability to detect satiety despite high energy stores. (Pan H, *et al*,2014)

Although regulation of fat stores is deemed to be the primary function of leptin, it also plays a role in other physiological processes, as evidenced by its multiple sites of synthesis other than fat cells, and the multiple cell types beside hypothalamic cells that have leptin receptors. Many of these additional functions are yet to be defined. (Halaas JL, *et al*,1995) Although leptin reduces appetite as a circulating signal, obese individuals generally exhibit a higher circulating concentration of leptin than normal weight individuals due to their higher percentage body fat. (Considine RV, *et al*,1996) These people show resistance to leptin, similar to resistance of insulin in type 2 diabetes, with the elevated levels failing to control hunger and modulate their weight. Leptin resistance is due to changes in leptin receptor signaling, particularly in the arcuate nucleus. Leptin is known to interact with amylin, a hormone involved in gastric emptying and creating a feeling of fullness. Due to its apparent ability to reverse leptin resistance, amylin has been suggested as possible therapy for obesity. (Roth JD, *et al*,2008) Dieters who lose weight, particularly those with an overabundance of fat cells, experience a drop in levels of circulating leptin. This drop causes reversible decreases in thyroid activity, sympathetic tone, energy expenditure in skeletal muscle, increased muscle efficiency and parasympathetic tone. The result is that a person who has lost weight below their natural body fat set-point has a lower basal metabolic rate than an individual at the same weight who is at

natural weight; these changes are leptin-mediated, homeostatic responses meant to reduce energy expenditure and promote weight regain as a result of fat cells being shrunken below normal size. Many of these changes are reversed by peripheral administration of recombinant leptin to restore pre-diet levels.^[29]

Hirsch found that, after months of dieting in the hospital (patients were fed precisely defined formula diets), fat cells shrank in size, but their number remained the same. It was difficult for obese patients to stay lean after dieting—as soon as they began consuming more calories, their fat cells refilled, and they re-gained weight. Along with other research, this led to the widely accepted adipose cell hypothesis: fat cells develop early in life and their number is fixed. (Obici, *et al*, 2003)



In a recent review of studies examining fitness and health outcomes of all-cause mortality, heart disease, type 2 diabetes, hypertension, and cancer, the researchers concluded that "active obese individuals actually have lower morbidity and mortality than normal weight individuals who are sedentary". (Hirsch J, *et al*, 1966) As the number of fat cells does not reduce once they have increased, and leptin resistance is the probable cause for obese persons regaining their weight after reducing it.

Some scientists believe that number of fat cells in the body can also affect appetite. According to this line of reasoning, fat cells maintain their size, and, once a "fat plateau" is attained, the body stays at that plateau. Fat cells can accomplish this by effectively taking up triacylglycerols and converting them to fat. Consequently, there is less energy available for muscle and body organs to compensate, appetite increases to provide needed energy. In support of this hypothesis, it is known that obese individuals have an increased amount of the enzyme lipoprotein lipase, which is responsible for the uptake and storage of triacylglycerols in fat cells.

Furthermore, in obese individuals who have lost weight, the levels of lipoprotein lipase increase even more. When people lose a large amount of weight, their feeding behavior also changes. They become hyper-responsive to external food cues, think of food often, and cannot get enough to eat without gaining weight. Thus a person who has lost a large amount of weight is a person with an increased appetite and a decreased ability to expend energy. It is no surprise that only a small percentage of obese people maintain weight loss on a long-term basis.

CONCLUSION

In conclusion who is doing regular exercise even without diet control shows reduction in body weight and consequentially reduction in BMI. If they stop the exercises even without diet controls leads to regaining of weight and also increase in BMI. Again it reaches the averages BMI initial before starting of exercise.

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