

# A STUDY OF CORRELATION BETWEEN CHANGE IN ENERGY INTAKES AND CHANGE IN BMI LEVEL AMONG URBAN PEOPLE

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**Abstract:** Although the idea that obese people consume higher calorie diets is widely accepted, many dietary surveys have shown that obese people do not consume larger amounts of energy. We had an opportunity to study the relationship between calorie intake and obesity in Raipur city the survey was executed for three months from October 1<sup>st</sup> to Dec.30<sup>th</sup> in 2013. The survey included 75 (aged >15 years) subjects of whom 50 women and 25 men. Researcher has visited each household and checked health status, and interviewed from the health questionnaires and food consumption of respondents was conducted. Subjects were classified by BMI (< 20, 20-22, 22-24, 24-26, 26-28, 28≤) main results were as following: 1) The Average calorie intake for men were 2564.8 Kcal with BMI of 26.7 and for women was 2513 Kcal with BMI of 28.8 have been reduced for men to 2054.8 Kcal and BMI 24.7 and for women 2012 Kcal with BMI of 26.4. 2) The change in BMI and dietary pattern were shown positive co relation in the study. After nutrition counseling the percentage of participants practicing usage of boiled/Luke warm water has increased significantly from 28% to 60%. There are several possible explanations for these results: 1) physical activity caused the weight of people to decrease even with the same energy intake; 2) people underreported their energy consumption; or, people intentionally reduced their energy consumption due to self- image regarding their obesity, because calorie intake was not higher in obese people than in non-obese people in Raipur.

**Keyword:** BMI, Obesity, Quetelet Index, Women, Raipur

## Introduction

The body mass index (BMI), or Quetelet index, is a measure of relative weight based on an individual's mass and height. It is defined as the individual's body mass divided by the square of their height – with the value universally being given in unit of kg/m<sup>2</sup>. The Quetelet Index instrument reformulation, instrument name title the Body Mass Index. The Quetelet or the Body Mass Index Universal Standard Metric Systems Units of Measurement, kilograms and meter square height, length, weight. It was invented between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics" (Body Mass Index/Wikipedia).The BMI is used in a wide variety of contexts as a simple method to assess how much an individual's body weight departs from what is normal or desirable for a person of his or her height. Although the idea that obese people consume higher calorie diets is widely accepted, many dietary surveys have shown that obese people do NOT consume larger amounts of energy ("BMI Classification" Global Database on Body Mass Index; World Health Organization. 2006. Retrieved July 27, 2012).

The etiology of obesity has not been accurately constructed, but one obvious fact about obesity is the balance problem of energy intake and expenditure.

The idea that obese people eat more than they expend is generally accepted. A lot of studies have provided the results that obese subjects consume more than normal or lean subjects (Kim, Wee, 2001; Mokhtar, Elati, Chabir, Bour, Elkari, Schlossman, Caballero, Aguenau, 2001; Waxman, Stunkard, 1980).

However, some studies have reported that the energy intake of overweight or obese people is not greater than expected (Garaulet, Martinez, Victoria, Perez-Llamas, Ortega, Zamora, 2000; Guillaume, Lapidus, Lambert, 1998; Kim, Moon, 2001; Miller, Lindeman, Wallace, Niederpruem, 1990; Ortega, Requejo, Andres, Lopez-Sobaler, Redondo, Gonzalez-Fernandez, 1995; Romieu, Willett, Stampfer, Colditz, Sampson, Rosner, Hennekens, Speize, 1988). Several studies of obesity in Korea have also shown the opposite results of what is a normally accepted idea (Kim, Park, Byoun, 2000; Lee, Sung, Choi, Lee, Cho, 2000; Yim, Yoon, Kim, Kim, Kim, Choi, 1993). Most of the research has interpreted this phenomenon as "under-reporting of energy intake" (Garaulet and colleagues, 2000; Lee and colleagues, 2000; Romieu and colleagues, 1988; Yim and colleagues 1993). In the present context author attempt to study the analysis of relationships between diet and health authors examined the energy intake level by BMI level and corresponding relationship

between change in BMI to change in energy consumption.

## Materials & Methods

### 1<sup>st</sup> Phase Survey

The study was conducted in two parts. In first phase the study looked at the use and consumption of leafy vegetables with understanding of dietary patterns. The Study was conducted at Raipur, capital of Chhattisgarh State. Total Period of study carried out from June 2013 to November 2013. People of Raipur city both men and women have been interviewed with the help of pre-defined questionnaire. The consent has been received from the respondent before the interview and they have given the freedom to answer the all /relevant questions. In order to overcome the biasness the city has been divided into 05 zone such as North, South East, West and Central zone. The respondents have been selected randomly from these zones. The 05 men and 10 women from each zone have been selected for the study. The measurements were taken with measuring tape and measured for their height (cms), weight (kgs) and waist circumference (cms). A digital scale BEURER was used to measure subject's weight in kilograms to the accuracy of 100gm. Height was measured barefoot and waist circumference (WC) was ascertained by tape measure Waist circumference was assessed in the standing position, midway between the highest point of the iliac crest and the lowest point of the costal margin in the mid-axillary line. Overall adiposity was assessed by Body Mass Index (BMI). The BMI was calculated as weight in kilograms divided by height in meters squared.

### 2<sup>nd</sup> Phase Diet Counseling

Consent was procured from the subjects and counseling was provided on diet, physical activity and behavioural modifications. Booklets "Lifestyle Modifications" and "Indian Food Items and their Calories" were provided which contain guidelines for selection of food items (low calorie, low fat alternatives, and food exchange list), guidelines for physical activity and behavior change, both in English and Hindi. Motivation to lose weight was also rendered by playing videos regarding obesity and its complications like diabetes; hypertension etc. Respondents were advised not to take more than three meals per day and 1-2 snacks per day. Also, they were asked to take the normal food as prepared for the rest of the family members and were informed

to avoid high caloric food items. Regarding exercise, they were asked to walk briskly at least 30 minutes a day; Subjects were also recommended to consult a dietician and fitness instructor for effective weight reduction. They were asked to follow this for three months and their diet and exercise patterns were reviewed at least once in a month. The weight, BMI and WC were measured again during their monthly visit. Based on the outcome of weight reduction, further counseling was provided.

### Data collection

The data were collected by interviewing the subjects in person. Demographic details and other information related to subject, complaints, past medical and medication history etc. were also collected by using specially designed schedule. Dietary data was obtained by 03 day recall method.

### Data Analysis

Results were expressed in the mean and average of the available data information has been taken for comparison of average daily energy level, BMI level and waist hips ratio level. Pearson's correlation coefficients were calculated for BMI with age, height, weight and body fat per cent and their significance for linearity was tested using F-test.

### Results

The Body Mass Index (BMI) measures the weight status of your body in relation to the fat. It is a simple tool that helps to figure out the amount of excess body fat and the associated risks of carrying this extra weight. It can be applied to both men and women. It is advisable to use 'Body Mass Index' along with 'Waist to Hip Ratio' to get a complete picture of your weight status. The Present study was conducted on 75 people of Raipur city of whom 66.66% were women and 33.33% were men, their distribution is given as below:

**Table 1: Characteristics of Subjects**

parameter	Men	Women	All
Age (Year)	27.1	28.0	27.73
Height (cm)	177.7	158.5	164.93
Weight (kg)	84.4	72.3	76.30
W/H Ratio	0.91	0.9	0.87
BMI	26.7	28.8	28.1

(kg/M <sup>2</sup> )			
Energy Intake (Kcal)	2564.8	2513.0	2530.26

The mean age of participants were for women were 28.04 years and for the men are 27.12 years. The Average daily energy intake for the men before and after the counseling was 2564.8 & 2054.58 and for the women was 2513 & 2012.98 respectively.

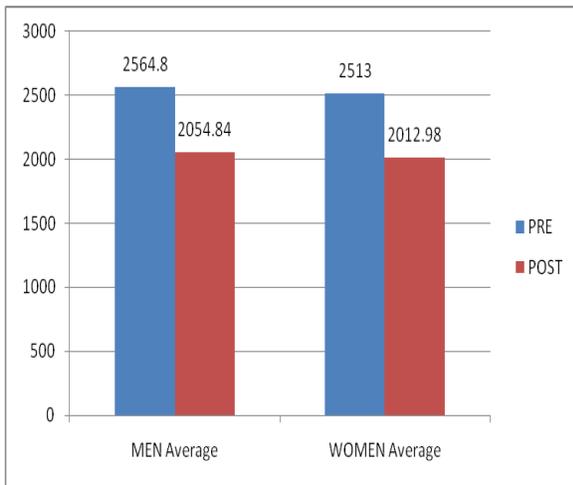


Fig: 1 Pre & Post calorie consumption

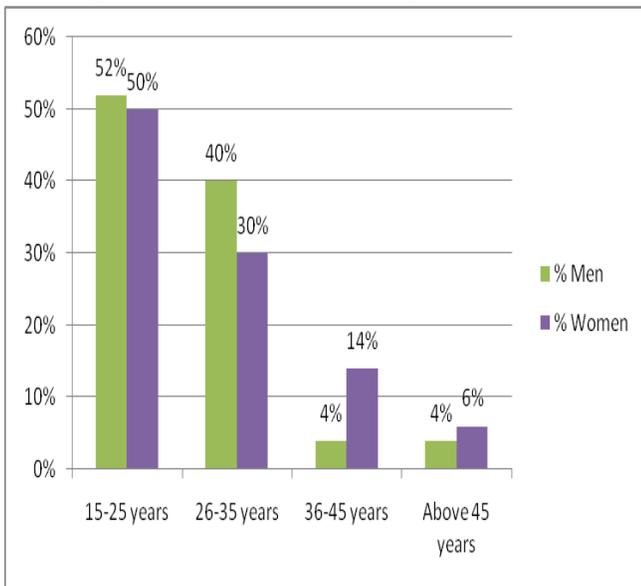


Fig 2: Distribution of Samples

The mean BMI level for men and women have also shown the great variation in before and after the diet counseling as mentioned below:

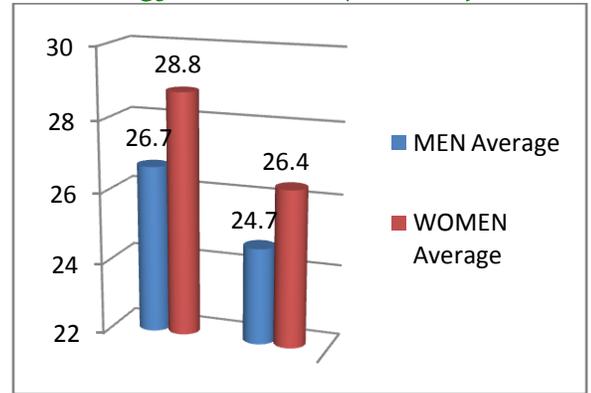


Fig 3: Pre & Post BMI Changes in BMI level

Changes in the dietary pattern has resulted in the changes in BMI level of the subjects as evident from the below graph that percentage of people having Luke warm water increased from 28% to 60%.

Waist Hips ratio of men and women under study has shown a little variation in pre and post counseling measurements for the men where as in case of women this trend is very sharp as the mean ration has changed from 0.9 to 0.8.

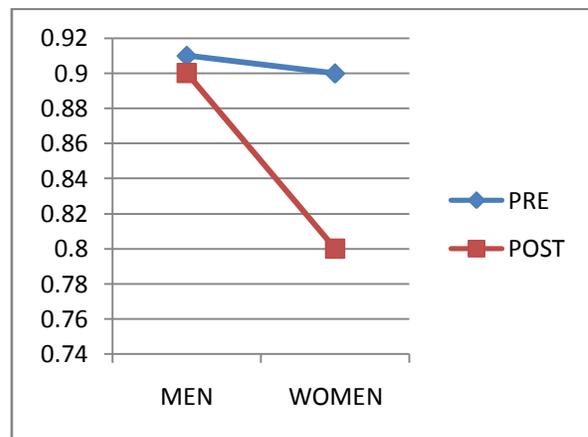


Fig 4: Pre & Post Changes in Waist Hips Ratio

BMI level and Calorie consumption trend: to understand the co relation between change in energy intake level and change in BMI level of subject estimation of Pearson's coefficient of correlation has been done on the sample population. As a thumb rule in statistics it is generally accepted that the following scale can be used to estimate the effect size:

Effect Size	Value of Pearson's Coefficient of Correlation (r)
Large	+/- 0.5
Medium	+/-0.3
Small	+/-0.1

**Table 2: Corelation Matrices**

It has been observed in the study that the BMI has the positive co relation with the change in daily energy intake of respondents. The correlation is said to be higher when the value of Pearson's coefficient of correlation is more than 0.5. As in our case the value of correlation is 0.53.

## DISCUSSION

Obesity has been thought to be caused by high energy intake and less energy expenditure (Garrow, 1988; Jequier, Tappy, 1999). Many studies have reported that the high fat intake or high proportion of energy from fat is associated with obesity (Alfieri, Pomerleau, Grace, 1997; Bray, Popkin, 1998; Guillaume and colleagues 1998; Mohktar and colleagues, 2001; Nguyen, Larson, Johnson, Goran, 1996; Ortega and colleagues, 1995; Romieu and colleagues, 1988). In industrial countries, calorie intake from fat is 40% or more of the total energy intake and obesity prevalence is very high (Jequier, Tappy, 1999; WHO, 2001). Although it appears that obese subjects consume high fat diets, Jequier has commented that fat is not a major cause for the development of obesity (WHO, 2001).

High energy intake was not sufficient to explain obesity. Furthermore, it is difficult to explain why all the groups with different BMI should take same amount of calories. There are some biological constraints which make body energy balance constant, and increased weight is balanced out by reduced activities. In support of this view, Guillaume and colleagues (1998) suggested that the positive energy balance causing obesity is due mainly to a low energy output.

However, it is also possible that a condition which causes less energy production, such as lowered mitochondrial function, as suggested by Lee (2001), causes obesity. This view is supported by Saltzman and Roberts (1995), who summarized in their review that in individuals who are genetically susceptible to weight gain, reduced energy expenditure for resting metabolism and/or physical activity appears to occur

in response to underlying metabolic mechanisms that create a drive for surplus energy.

In this study, subjects who had higher BMI showed lower fat intake and a lower proportion of energy from fat. Rather than fat intake, alcohol consumption was related to obesity.

Parameters	Change in Calorie	Change in BMI
Change in Calorie	1	
Change in BMI	0.53	1

**Table 3: Correlation Between BMI and Calorire**

There might be several possible explanations for our results. First, reduced physical activity may increase the weight of obese people even at the same energy intake. Kuboonchoo (2001) has suggested that the increase in obesity is the result of reduced physical activity, and other studies have reported the obese tend to be less physically active (Miller and colleagues, 1990; Garaulet and colleagues, 2000; Romieu and colleagues, 1988; Waxman, Stunkard, 1980). This relationship sufficiently explains the weak inverse relation between body size and caloric intake that has been observed in most epidemiologic studies (Willett, 1998).

In this study, it is hard to say if there is a correlation between BMI and exercise. But exercising subjects (1-5 times a week) had higher energy consumption than subjects with no exercise or every day exercise. More investigation is needed about exercise, BMI, and energy intake.

A second possible explanation may be underreporting of information. Several studies have reported the confirmed underreporting of energy intake in obese subjects (Lichtman, Pisarska, Berman, Pestone, Dowling, Offenbacher, Weisel, Heshka, Mattews, Heymsfield, 1992; Zhang, Temme, Sasaki, Kesteloot, 2000). And some reports have argued that the prevalence of underreporting and the degree of underreporting of energy intake were increased with increasing BMI (Gnardellis, Boulou, Tricholpoulou, 1998; Zhang and colleagues, 2000).

The other explanation is the intentional reducing of energy consumption by self-image of obesity. Less obese people intentionally reduce the amount of calories in their diet because they thought they were obese. Decreasing fat intake by BMI increasing might be a reflection of nutrition knowledge. When considering the change of dietary patterns after subjects became aware of their diseases, we

compared the energy intake. A significant difference in energy and other macronutrient intakes with the lower BMI, weight were showed. This seems to present us with the peculiar fact that there is lack of awareness among the people about the healthy living and the proper nutrition counseling may be of great help.

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