



## An Observational Study of Nutritional Assessment and Clinical Parameters among-Professional Females: The Efficacy of Diet Counseling Adherence for Nutrition Upliftment

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### Abstract

**Introduction:** Behavioral and lifestyle factors, including disordered eating habits, impact the development of adolescents and results in overweight and obesity in adults. Abdominal obesity is a major risk factor and an important public health issue because of the economic burden it imposes and its effect on the quality of life.

**Objectives:** The present study was aimed to study the anthropometric, diet diversity, clinical parameters, and to determine the effect of counseling on these parameters and adequacy of nutrients.

**Methodology:** The study was conducted at a tertiary care hospital. A total of 150 working female staff aged from 25-30 years were studied. The data on anthropometric measurements, clinical parameters and dietary assessments were recorded before and after nutrition counseling.

**Results:** The mean weight recorded was  $(67.2 \pm 11.5)$  kg. It was reported that 50% were overweight, 20% Grade I obese and 14% were in Grade II obesity. Increased waist hip ratio (WHR) was prevalent in 82.76% of total subjects. Post counseling significant reduction for BMI in overweight category was observed i.e. from  $(24.6$  to  $21.06)$   $\text{kg}/\text{m}^2$ . WHR showed significant reduction ( $P \leq 0.01$ ) from 82.76% to 54%. HDL increased from 35% to 54% and LDL decreased from 36% to 24%. Post counseling proteins intake showed an

increase from 25% to 46.3% and dietary fiber increased from 10% to 25%.

**Conclusion:** The present study showed the gravity of nutritional risks in adolescents and importance of timely assessment and customized nutritional counseling as intervention on anthropometric and clinical risk parameters.

**Keywords:** Body Mass Index; Obesity; Waist Circumference; Waist Hip Ratio

### Introduction

During adulthood nutrients are required for the purpose of energy, for replacement of worn out tissues and maintenance of body functions. Though there is no growth during adulthood, protein is required for the replacement of worn out tissues. The nutrition transition patterns were examined for nutrition-related non-communicable diseases (NR-NCDs) by showed that impact of dietary and activity pattern shifts in obesity on a worldwide basis [1]. It is estimated that, by 2025 nearly 268 million children and adolescents in 200 countries will be overweight, 124 million will be obese. India is suffering from a dual burden of malnutrition and hidden hunger. The diet is more "energy-dense" rich in saturated fat and sugar but deficient in complex carbohydrates and micronutrients. Obesity incidence increased 2 folds between 1980 and 2014 worldwide According to the World Health Organization (WHO) report [2]. Dietary transition is the major factor behind under-nutrition and over-

nutrition. Every second Indian woman is reported to be anemic and more than one-third suffer from chronic energy deficiency. Cardiovascular diseases, certain types of cancers, type 2 diabetes, hypertension, osteoarthritis, gall stones, dyslipidemia and musculoskeletal problems results from overweight and obesity [3-5]. A study conducted on nurses' health revealed that Overweight /obesity were the most single predictors of diabetes [6]. Average 75% of obese adolescents became into obese adults and carry the same risk of co-morbid disease in adulthood too [7]. However this measurement does not account for variation in body fat distribution and abdominal fat mass. Excess intra-abdominal fat is associated with greater risk of obesity related morbidity than in overall adiposity [9]. Waist circumference (WC) and waist-hip ratio (WHR) are the measures of visceral or abdominal fat mass. These measures are independent of height and muscle mass, have emerged as important predictors of risk of obesity related diseases and are thus very useful indicators of excess body fat and increased health risk [8]. Many countries adopt and execute various national policies for obesity prevention and for reducing the socio-economic burden by obesity [5-6]. Also there are increasing attention and interest in developing nutrition counseling program for weight control of the obese [7-8]. During the time in university which corresponds to the early adult period social and emotional development are completed with physical maturity and one's dietary habit is determined [9]. The purpose of present study was to evaluate body mass index (BMI), waist circumference (WC) and waist-hip ratio (WHR) as predictors of health risk for being overweight and to assess the effect of counseling amongst the selected subjects. In women, BMI was associated with increased risk of these diseases; however, waist-hip ratio appeared to be a stronger independent risk factor than BMI [10]. An undernourished girl is at the risk of developing complications during pregnancy and giving birth to a low birth weight baby, thus perpetuating a vicious cycle of malnutrition and ill-health. Thus a vicious circle (mother-child-mother) of malnutrition seems to have set in community for generation. This vulnerability is not restricted to one person. Therefore, diseases blamed on lifestyle can often start before birth. Clearly, India is eating less and the choice of food is unhealthy. By keeping in mind all the facts we designed a relevant nutrition counseling intervention study was designed that would address the needs of this age group.

## Material and Methods

### Selection of Subjects

A sample of total of 150 working female staff aged from 25-30 years was studied purposively from tertiary care hospital as a part of regular health checkup under the hospital protocol. Necessary approval was obtained from authorities prior to the commencement of the study. Informed consent was taken by the subjects.

Nutrition education was given using developed pamphlet and charts showing the necessary dietary guidelines and importance of nutrition according to their nutritional and

clinical status. To find out the effectiveness of nutrition education, a standard questionnaire was distributed among the subjects to answer, before and after nutrition counseling.

### Composition of the Nutrition Counseling Program

Nutrition counseling program consisted of 30-minute nutrition counseling once a week. Nutrition counseling was performed at the scheduled day and time every week in the health management center. Nutrition counseling program was performed according to the weekly plan and the nutrition counseling technique was differentially applied according to the investigated checklist which indicates steps of personal behavior change of subjects for the selection of the study participant. The results of counseling were analyzed for pre and post.

### Food Intake of the Subjects

The nutritional intake was analyzed by '24-hour recall' method developed by the National Institute of Nutrition, Hyderabad, India [11].

### Evaluation of Nutrient Intake of the Subjects

The energy and nutrient intake were evaluated according to the information about the food intake followed by obtaining the subject's nutrition intake rate to the recommended dietary allowance and calculating the amount of energy and nutrient intake.

### Anthropometric Parameters and Blood Analysis

All the anthropometric measurements were taken following the standard techniques recommended and body mass index (BMI) was computed using the standard equation:  $BMI (kg/m^2) = Weight (kg) / Height (m^2)$  [12]. Waist circumference was measured using a measuring tape over the unclothed abdomen, with measurements made halfway between the lower border of the ribs and the highest point of iliac crest (at the umbilicus level) in the standing position. Participants with waist circumference of 80-87.9 cm were classified as overweight and with >88.0 cm were classified as obese [13]. Hip circumferences were measured over light clothing at the widest point over the buttocks when viewed from the side. Waist hip ratio was obtained by dividing the waist circumference by hip circumference. The participants with WHR 0.80-0.84 were classified as overweight and with  $WHR > 0.85$  were classified as obese [13]. Mean intake of nutrients was computed using the recommended dietary allowances suggested for Indians (ICMR 2010) [14]. The blood test was performed by hospital under their regular health checkup which were obtained under this study. The level of total cholesterol, high-density lipoprotein (HDL), cholesterol, Glycosylated haemoglobin (HBA1C) whole blood were obtained from health checkup report card.

## Results

The mean age of the study group was 28 years. The mean weight was recorded (67.2±11.5) kg (Table 1) where shows the prevalence of waist circumference and waist hip ratio. The measurements of waist circumference shows that out of 150 subjects 131 i.e., (87.3%) had increased WC and only 12 i.e., (8%) fell under normal category. However post nutrition counseling the percentage of increased WC of the subjects reduced from 87.3% to 52.6%. When classified as per waist-hip ratio.82.6% was found obese. Post Nutrition counseling significant reduction in WHR (P≤0.01) was seen. The decrease of obese category to overweight and normal weight

category i.e., 54% and 46% respectively was due to reduction of body weight .As the subjects were taught to control their body weight by improving their eating habits and life style pattern (Table 2) reveals that out of the total subjects 67.7% had normal BMI (18.5-24.9kg/m<sup>2</sup>). Thirty three (50%) participants had BMI in the range of 25.0 to 29.99 kg/m<sup>2</sup> which is considered to be overweight. The 10(%) were obese with BMI>30 kg/m<sup>2</sup>. Almost similar findings were observed for obese i.e., 8.0% when classified as per waist-hip ratio. Three fold increases in overweight category was found by the measurements of WC when compared to classification of subjects according to BMI.

Pre Counseling Mean ±S.D			Post Counseling Mean ±S.D		
Age (in Years)	Height (in cm)	Weight (in kg)	Age (in Years)	Height (in cm)	Weight (in kg)
28±2.3	163±5.4	62.2±11.5	45±2.8	153±0.59	69.1±10.3
WC Increased >80cm n=131	WC Substantially Increased > 88cm n=12	WC Normal <80cm n=7	WC Increased >80cm n=79	WC Substantially Increased > 88cm n=38	WC Normal <80cm n=33
86.5±0.97	98.2±8.7	73.2±3.75	-	93.1±3.6	38.9±9.06
WHR					
Substantial increase≥0.85 n-124		Normal<0.80 n-26	Substantial increase ≥0.85 n-81		Normal<0.80 n-69
0.89±0.03		0.78±0.01	0.81±0.26		0.75±0.08
P value		-	0.012*		0.047*
*P < 0.01 -WC-Waist circumference, WHR-Waist hip ratio					

Table 1: Subjects classified according to anthropometric status pre and post nutrition counseling.

BMI(Kg/m <sup>2</sup> ) Classification	Underweight <18.5	Normal weight 18.5-24.9	Overweight 25-29.9	Obesity Class 1	Obesity Class II	Obesity Class III
Pre Counseling	17±0.069 n--0	22.4±2.63 n-101	27±1.7 n-33	31±1.26 n-9	36.1±1.49 n-5	45.3±3.04 n-2
Post Counseling	17.1±0 n-0	23.6±2.01 n-131	28±1.51 n-15	31±1.26 n-4		

Table 2: Classification of subjects into grades of BMI pre and post nutrition counseling.

Table 3 represents that subjects were found with border line and high risk cholesterol both (31%) which decreased to 25%. Around 35 % of the participants studied had HDL above

the risk level of below 45 mg/dL which increased to 54% post nutrition counseling whereas LDL decreased from 36% to 4%. Only (3%) found in pre-diabetic and diabetic range.

Clinical Parameters	Clinical assessment					
	Pre counseling			Post counseling		
HBA1C	Normal less than 5.7	Pre-diabetes 5.7-6.4	Diabetes 6.5 or higher	Normal less than 5.7	Pre-diabetes 5.7-6.4	Diabetes 6.5 or higher
	5.2±0.35 n-140	5.76±0.89 n-5	5	5.2±0.35 n-143	6.08±0.25 n-3	7.8±2.00 n-4

CHOLESTEROL	Desirable less than 200	Borderline 200-239	High risk more than 239	Desirable less than 200	Borderline 200-239	High risk more than 239
		147.1±20.5 n-56	211±10.5 n-47	- n-47	145±421.2 n-73	219±8.22 n-38
HDL	High risk <45	Borderline 45-60	Desirable >60	High risk <45	Borderline 45-60	Desirable >60
	36.3±4.72 n-59	51.8±5.25 n-39	64.7±4.78 n-52	42.2±1.35 n-42	52.9±0.00 n-27	- n-81
LDL	Optimal<100	Near/ above optima100-120	high 160-189	Optimal<100	Near/above optima100-120	High 160-189
	76.7±12.8 n-42	112.1±9.49 n-54	164±8.08 n-54	79.5±13.2 n-66	114.2±7.75 n-48	173.2±13.2 n-36

**Table 3:** Biochemical parameters of subject's pre and post nutrition counseling.

The average daily food intake of the subjects is given in (Table 4). It was observed that the mean intake of cereals among the subjects was 203±55.45gm and for millets 78.1±67.68 gm. The protein intake of subjects pulses 30.9±20.67 gm was very low which is less than desirable intake of

1.0 g/kg body weight for adult women .The commonly consumed fruits by the subjects were apple, banana, orange and tomato etc. The mean daily intake of fruits was 50.5±30.17gm.

Food groups	Mean (gm) ± SD	Food groups	Mean (gm)± SD
Cereals	203.4 ± 55.45	Other vegetables	84.8 ± 56.33
Millets	78.1 ± 67.68	Milk products	23.5 ± 61.3
Pulses	30.9± 20.67	Fats and oils	38.7 ± 6.14
Green leafy vegetable	30.4± 63.07	Sugar	18.29 ± 7.85
Roots and tubers	87.7 ± 38.9	Fruits	50.5 ± 30.17

**Table 4:** The average daily food intake of the subjects (gm/day).

The protein were intake increased after nutrition counseling due to inclusion of legumes, sprouts and curd regular in diet as shown in (Table 5). After nutrition counseling, daily intake of green leafy vegetables increased which elevated iron, fiber, thiamin of the subjects .Subjects came to know about the importance of GLV's being cheap source of vitamins, minerals and fiber. The subjects who were not in habit of taking milk started consuming milk post counseling at least once a week which increases calcium and

protein in diet .Improvement was seen in more intake of salads, other vegetables like cabbage, peas which are high in fiber and provide more satiety in their daily dietary meals. An increase in the variety of fruits and vegetables because as their beneficial effects were taught during nutrition counseling sessions like soluble fiber found in legumes and fruits decreases fat absorption and contain antioxidants which protect our body from harmful free radicals. The intakes of fried food, high fatty snacks, and bakery items were reduced.

NUTRIENTS	PRE Mean ± SD	POST Mean ± SD
Protein(g)	30±11.6	49±10.4
Fat (g)	45±16.3	25±12.7
Dietary Fiber (g)	9.0±9.3	12.6 ±11.3
Energy (Kcal)	3179 ±486	2250±441
Calcium (mg)	517±409	903±231
Iron (mg)	9.7±10.8	13.1±5.9
Thiamin (mg)	1.04 ±0.4	1.09 ±0.3

**Table 5:** Mean nutrient intake of subject's pre and post nutrition counseling.

## Discussion

The study also showed a positive correlation between BMI and WHR. The nutrient intakes were compared pre and post counseling with the respective RDA and the percent adequacy was computed. By intervening through educating the group through rigorous counseling, for mind full eating significant improvement was reported in all parameters. Post counseling Significant improve were seen in blood parameters of both the age groups which contributes in the development of various co morbidities. Higher BMI was related with minimal energy expenditure and increased calorie intake in this study. Employments lead living a life which involves less physical activity. Energy-dense food which is easily available considered to cause overweight or obesity. The impact of lifestyle disorder cannot be overlooked because people compromise their health overeating habits and succumb to various illness and leading to impaired quality of life, and increase in health-care cost. Hence welfare programs have to be implemented in such a way that at least one member in a family should acquire the capacity to learn which enables the families to have adequate access to right type and amount of food for maintaining good health not merely for a weight loss plan. Nutrition counseling should not suffer from a lack of effective counseling tools. Thus to conclude it is emphasized that nutrition counseling is a unique approach in imparting the knowledge regarding optimal nutrition that could prevent or delay adult-onset diet related illnesses later on. For health care providers the aim should to deliver customized diet plan. Therefore, all the subjects if given proper education regarding healthy food options and lifestyle modifications could help in maintaining weight and prevention of early onset of NCD.

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