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RESEARCH ARTICLE

A CORRELATIVE STUDY: DAILY FOOD INTAKE REDUCES LIPID AND BLOOD GLUCOSE LEVELS IN OBESE SUBJECTS

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ABSTRACT

Obesity is one of emerging health problems of 21st century. World Health Organisation (WHO) has declared Obesity as one of top ten health risk in the world (2000) and this is because it increases the risk of life threatening conditions, including Type 2 Diabetes Mellitus, Hypertension, Heart disease, sleep disorders and many cancers and feeling of alienation from society. Young generation is prone to many medical disorders which are related to Obesity. Obesity is a growing serious medical condition that demands a preventive management. Therefore a study was conducted on Five hundred Obese Subjects belonging to rural area of Kurukshetra and urban area of Delhi (NCR). The selected subjects were 18-25 years of age and were suffering from Non- Communicable diseases. The blood testing of the subjects indicated High Lipid and Blood Glucose levels. The subjects were divided into experimental groups as E1 (Exercise group), E2 (Hypocaloric diet), E3 (Exercise & Hypocaloric diet) and a control group. The Fasting serum glucose, Total cholesterol, VLDL-C, LDL-C, and Serum Triglyceride levels were more than the average values in about 80 per cent of both male and female subjects respectively. The variation in Fasting Glucose levels, LDL cholesterol levels, VLDL-C and serum triglycerides among the groups before and after the study in males and females of Delhi and Kurukshetra was highly significant ($P < 0.01$). Therefore the weight reducing interventions viz. E1(Exercise), E2(Hypocaloric diet), E3 (Exercise plus Hypocaloric diet) were effective in reducing the increased blood lipid and glucose values to normal reference levels. The correlation between Anthropometric parameters, Blood parameters and Dietary intake was also highly significant ($P < 0.01$).

INTRODUCTION

WHO (2000) expert consultation on obesity warned of an escalating epidemic of obesity that would put the population of most countries at risk. In Obesity the intra-abdominal visceral deposition of adipose tissue which characterizes upper and central obesity is major contributor for development of hypertension, elevated plasma insulin concentration and hyperlipidemia in young adults (Kopleman, 2006). WHO with IOTF (1997) held an expert consultation on Obesity that resulted in publication of report, for prevention and management of global epidemic obesity. The IOTF was established in May 1996 to tackle the emerging global epidemic. The task force is composed of the world experts in the field of Obesity including China, Japan, Chile, Australia, Brazil, USA, Canada and Europe (IOTF, 2004). Their principal strategy is prevention through changing the environment in such a way to make less 'Obesogenic' to the individual. The focus has been on how to tackle obesity in young adults in many parts of the world (Canberra, 2003).

Review of Literature

According to Zand (2008) "Eating and exercise habits are the greatest determinants of individuals who end up in a condition called obesity."

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Over eating could be due to many reasons, some people simply love food and some subconsciously equate food with emotional comfort, and eat to cope with feelings of depression, failure or low self esteem. So reasons for over eating could be due to social, psychological and emotional factors". The social environment plays an important role in cause of obesity. The family and home is an important place to learn about nutrition and physical activity. A study done in America on young adults showed that they spent a lot of time in college, where their food choices were influenced by college eating environment (Heller, 2003). Similarly, young generation have their peer influence in colleges. The young generation is more inclined towards wrong eating habits such as drinks, fast foods and junk foods. (Kumar, 2007).

MATERIALS AND METHODS

Locale of the Study

The study was conducted on young adults belonging to the rural and urban cities of Kurukshetra and Delhi (NCR) respectively.

Phase I: Selection of the Subjects

- One thousand young adults between 18 - 25 years of age were selected from different localities and institutions,

namely - Kurukshetra (Ladwa), and Delhi (NCR) region and slimming centres .

- The height and weight of all the subjects were measured to find the obese subjects among them.
- From above the BMI was calculated by following the method of Quetelet (1835) and five hundred obese subjects were selected by purposive sampling.
- All the selected five hundred subjects were (i) Obese with body mass index (BMI) of > 29.9 kg/m² (ii) Free from any serious disease. (iii) Not following any dietary restrictions. (iv) Out of the surveyed young adults, 320 subjects were selected randomly from the regions of Kurukshetra and Delhi (NCR) for the experimentation both taken equally from either sex (n= 160 each). The 160 males comprised of Kurukshetra and Delhi (NCR) regions, 80 from each one. This division was also exercised for the females accordingly in the same manner. (v) The objective and experimental protocol of the study was explained to the subjects, and their prior consent was taken.

Table 2.1. IOTF – proposed classification of BMI

BMI Kg/m ²	Classification
< 18.5	Under weight
18.5 – 22.9	Normal Weight
23.0 – 24.9	At risk for obese
25.0 – 29.9	Obese I
> 30	Obese II

Phase II: Experimental Groups

- E1 (Exercise group) – This group was doing exercise only.
- E2 (Hypocaloric Diet) – This group was following Hypocaloric Diet only as suggested by the investigator.
- E3 (Exercise & Hypocaloric Diet) - This group was following both Exercise & Hypocaloric Diet only as advised by the investigator.
- Control Group (C) – This group was not following any Dietary restrictions and were following exercise regimen also on their own.

Phase III:

The studies done on the parameters studied / examined on the control and the experimental groups are:

- Assessment of nutritional status by anthropometry, body fat measurement and dietary survey, both before starting and at the end of experimental period of three months.
- Measurements of weight, waist and hip circumferences at the end of every month.
- Biochemical analysis of blood of a sub sample of subjects from each group of determining Fasting glucose, Hemoglobin levels and Lipid profile, both before starting and at the end.
- Dietary counselling of the subjects of groups E₂ (hypocaloric diet) and E₃ (hypocaloric diet + cardio exercise) before starting and throughout the study period to help them in selecting a diet containing approximately 1200-1300 k calories.
- In addition, all the subjects were asked to continue with their existing style or dietary pattern. Subjects of the control group were asked to continue with their usual dietary, activity and life style pattern throughout the study period.

Collection of blood samples: Fasting blood samples (5ml) were obtained by the technician, by vein puncture from the antecubital vein in the morning, into a disposable centrifuge tube. The blood was allowed to clot and then centrifuged at 3000 rpm for 15 minutes to separate the serum. The serum was stored in acid washed mineral free glass vials and was frozen.

Analysis of blood samples: The serum was analysed for glucose, triglycerides, total cholesterol and high density lipoprotein cholesterol by using standard methods. Low density lipoprotein cholesterol and very low density lipoprotein cholesterol were calculated from triglycerides by using the equation given by Friedewald *et al.* (1972).

Serum glucose: Serum glucose was analysed by BIOTRON BTR 820 Auto Blood Analyser based on GOD/POD method of Trinder (1969).

Serum total cholesterol: Enzymatic method of Allian *et al.* (1974) was used to analyse serum total cholesterol with the help of BIOTRON BTR 820 auto blood analyser.

Serum high density lipoprotein cholesterol: Serum high density lipoprotein cholesterol (HDL-C) was measured by using BIOTRON, BTR 820 using Phosphotungstate method (Lopes –Virella *et al.* 1977).

Serum low density lipoprotein cholesterol: Its value was calculated with the help of an equation given by Friedewald *et al.* (1972).

$$LDL \text{ cholesterol (mg/dl)} = \text{Total cholesterol} - \frac{\text{Triglyceride}}{5}$$

Serum very low density lipoprotein Cholesterol: The value of serum very low density lipoprotein cholesterol (VLDL-C) was calculated according to Friedewald *et al.* (1972) –

$$VLDL = \frac{\text{Triglyceride}}{5}$$

Serum triglycerides: Autopack reagent kit by Enzymatic DHBS colourimetric method (Eggsterin and Kuhimann, 1974) was used to estimate Serum triglycerides.

RESULTS

Fasting blood glucose: The correlation of fasting serum glucose levels of subjects belonging to Kurukshetra and Delhi (NCR) was found significant (P ≤ 0.01) with anthropometric parametres and dietary intake.

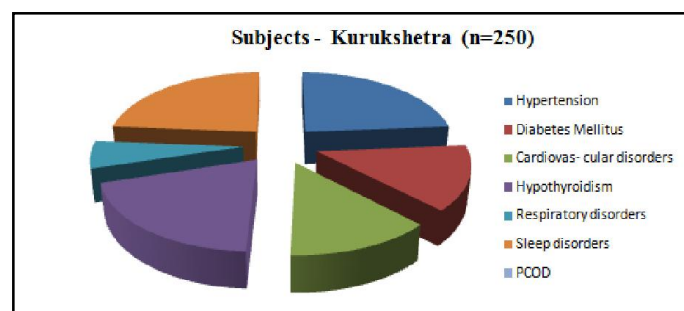


Fig. 1. Prevalence of Non-Communicable Diseases in the subjects belonging to the region of Delhi (NCR) & Kurukshetra before the Weight reducing interventions

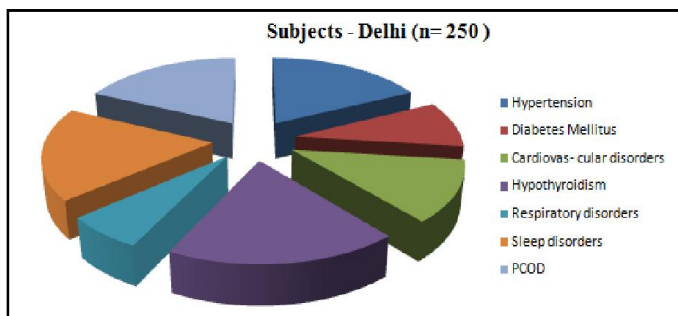
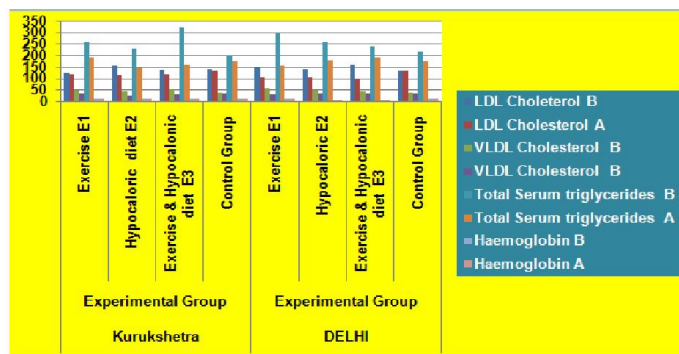
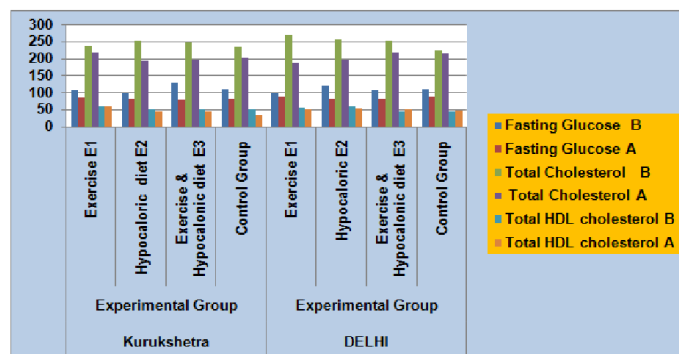


Fig. 2. Mean of daily food intake of young male human adults before (B) and after (A) weight reducing interventions



The graph shows clearly the levels of Blood Glucose , Total cholesterol , HDL , VLDL , LDL were significantly came down in subjects following Hypocaloric Diet and Hypocaloric diet with exercise

The fibre intake (r=0.389 and r=0.671) and TSF (r=0.331 and r=0.410) were correlated non significantly with fasting serum glucose of obese subjects belonging to Kurukshetra and Delhi (NCR) respectively.

Total cholesterol: The correlation of total cholesterol with anthropometric measurements was significant (P ≤ 0.01). The correlation of serum total cholesterol with fibre intake (r= 0.621 and r=0.523) was non significant in subjects of Kurukshetra and Delhi (NCR) region.

HDL – Cholesterol: The correlation of HDL-Cholesterol levels of subjects belonging to Kurukshetra and Delhi (NCR) was found significant (P ≤ 0.01) with anthropometric parametres and dietary intake.

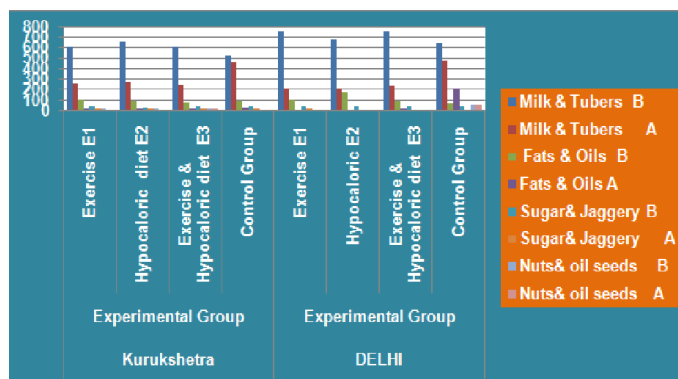
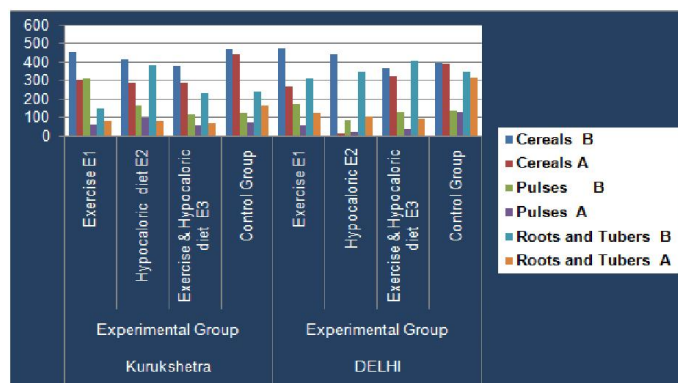


Fig. 3. Blood parameters of Obese subjects before and after Interventions belonging to regions of Kurukshetra and Delhi (NCR)

Table 1. Correlation of blood parameters of the subjects of Kurukshetra and Delhi (NCR) with their anthropometric parameters and nutrients intake after the commencement of weight reducing interventions

Blood Parameter	Region	Weight	BMI	WHR	TSF***	Fat%	Energy	Protein	Fat	Carbo hydrates	Fibre
Fasting Glucose	Kurukshetra	0.680**	0.432**	0.589**	0.331 ^{NS}	0.410*	0.431 ^{NS}	0.566**	0.468**	0.491**	0.389 ^{NS}
	Delhi	0.812**	0.776**	0.890**	0.910**	0.873**	0.711**	0.599**	0.812**	0.565*	0.671 ^{NS}
Total Cholesterol	Kurukshetra	0.678**	0.882**	0.831**	0.912**	0.344*	0.821**	0.345**	0.780**	0.870**	0.621 ^{NS}
	Delhi	0.771**	0.681**	0.592**	0.881**	0.792**	0.780**	0.410**	0.782**	0.400**	0.523**
HDL -Cholesterol	Kurukshetra	0.721**	0.689**	0.523 ^{NS}	0.777**	0.321**	0.921**	0.688 ^{NS}	0.833**	0.736**	0.661 ^{NS}
	Delhi	0.601**	0.431 ^{NS}	0.272 ^{NS}	0.452 ^{NS}	0.564**	0.724**	0.328 ^{NS}	0.781**	0.735 ^{NS}	0.318 ^{NS}
LDL -Cholesterol	Kurukshetra	0.789**	0.721**	0.720**	0.891**	0.392*	0.989**	0.631**	0.910**	0.810**	0.581 ^{NS}
	Delhi	0.788**	0.772**	0.555**	0.801**	0.452**	0.922**	0.620**	0.821**	0.562*	0.435 ^{NS}
Serum Triglycerides	Kurukshetra	0.832**	0.721**	0.823**	0.752**	0.821**	0.882**	0.098**	0.991**	0.771**	0.572 ^{NS}
	Delhi	0.912**	0.882**	0.821**	0.791**	0.777**	0.739**	0.760**	0.821**	0.920**	0.221 ^{NS}

NS - Non Significant Value:

* Significant value at (P < 0.05), **Significant value at (P < 0.01), *** Sum of four skin folds (triceps + biceps + suprailiac & sub scapular)

The ‘r’ values of the various parametres were - weight (r=0.680 and r=0.812) , BMI (r=0.432 and r=0.776) , WHR (r=0.589 and r=0.890), and energy (r=0.431 and r=0.711), protein (r=0.566 and r=0.599), fat (r=0.468 and r=0.812) and carbos (r=0.491 and r=0.565) for subjects of Kurukshetra and Delhi (NCR) region respectively.

The correlation of subjects of Kurukshetra with WHR (r=0.523) and fibre (r=0.661) was non significant. The HDL-Cholesterol of subjects of Delhi (NCR) region was correlated non significantly with BMI (r=0.431), WHR (r=0.272), TSF (r=0.452), protein (r=0.328) carbos (r=0.735) and fibre (r=0.318).

LDL – Cholesterol: The correlation of LDL-Cholesterol levels of subjects belonging to Kurukshetra and Delhi (NCR) was found significant ($P \leq 0.01$) with anthropometric parameters and dietary intake.

Serum Triglycerides: The correlation of serum triglycerides with anthropometric parameters was significant ($P \leq 0.01$). The serum triglyceride levels were correlated significantly ($P \leq 0.01$) with their energy ($r = 0.882$ and 0.739), protein ($r = 0.698$ and 0.760), fat ($r = 0.991$ and 0.821), carbs ($r = 0.771$ and 0.920) intake in subjects belonging from Kurukshetra and Delhi (NCR) region

DISCUSSION

The nutritional assessment of the subjects was done. The method of dietary survey was adopted to calculate the dietary intake of the subjects. The different nutrient intake of the subjects was recorded and calculated by Nutriguide Computer Programme. The clinical signs were also noted according to ICMR score card so as to depict malnourishment among the subjects. The biochemical analysis of blood was also completed on a subsample of 80 male and female subjects from Kurukshetra and Delhi respectively to calculate Lipid profile, Fasting glucose level and Hemoglobin levels.

According to Fig.1. The young obese subjects were suffering from the diseases as Diabetes Mellitus, Hyperlipidemia, Polycystic Ovarian Syndrome, Hypertension and Hypothyroidism. After the weight reducing interventions the daily food intake of the subjects in terms of Cereals, Pulses, Sugar and Fats was reduced to significant levels as shown in fig.no.2. The subjects were asked to follow a 1200-1300 kcal Diet plan as advised by the investigator. The food, nutrient intake and anthropometric measurements were analysed statistically before and after study period in the above subjects. The mean value of lipid profile was really high and after weight reducing interventions viz. Exercise (E1), Hypocaloric Diet (E2) and Exercise and Hypocaloric diet (E3) the mean values of lipid parameters and fasting glucose were reduced. The present study was carried on young male and female obese adults belonging to regions of Kurukshetra and Delhi. The blood parameters and Anthropometric parameters of the subjects belonging to control group had no significant impact after the weight reducing interventions. Further the correlation was also found between various parameters as mentioned above. According to Table 1. the correlation among the blood parameters, Anthropometric parameters and Diet / Food intake was very much significant ($P \leq 0.01$).

Conclusion

According to this study, the young generation is attracted to junk, fast or bakery food groups. The causes were modernization, better economic status and change in their environment. Further the youngsters were working in night shifts and their alcohol consumption was also increasing day by day.

This was major cause of malnourishment among youngsters. The wrong food habits contributed to the apple shaped body of the subjects which was a major cause for non-communicable diseases such as Hypertension, Diabetes Mellitus and Hyperlipidemia. The nutrition education and dietary counseling was provided to the subjects and positive reduction in weight and management of the diseases was also achieved.

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