RESEARCH PAPER INTERNATIONAL JOURNAL OF PURE MEDICAL RESEARCH

Medicine

KEYWORDS:

STUDY OF BIOCHEMICAL AND BEHAVIOURAL FACTORS IN OBESE AND OVERWEIGHT INDIVIDUALS IN HEALTH CHECK UP CONDUCTED AT SHREE KRISHNA HOSPITAL, KARAMSAD

Volume-3, Issue-8, August - 2018

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Article History
Received: 18.02.2018
Accepted: 07.06.2018
Published: 10.08.2018

ABSTRACT:

INTRODUCTION: Obesity is a complex condition involving biological, psychological, socio cultural aspect.This exploratory study is aimed to offer insight into the psychological causative factors of obesity.

MATERIAL AND METHODS: This prospective cross-sectional case-control study was conducted at Shree Krishna Hospital from January to October 2013.Individuals >18 years and BMI > 23 were cases. BMI of < 23 were taken as controls. 63 cases and 49 control were evaluated for their behavioural profile as per the Performa and Questionnaires

RESULT AND ANALYSIS:. Biochemical profile of the patients revealed that Normal, Preobese and Obese had no significant difference in their biochemistry. Psychological profile of the patients studied revealed that 80% of patients had their Locus of food control External, 28% had mild stress, 8% had severe depression, and 14.2% were Impulsive.Statistical analysis revealed that there was no statistical correlation between BMI and Biochemical and Psychological parameters.CONCLUSION: the psychological abnormalities should precede biochemical,anthropometric abnormalities. KEYWORDS: obesity, psychological, biochemical

INTRODUCTION:

For thousands of years, obesity was rarely seen. It was not until the 29th century that it became common, so much so that so that in 1997 the World Health Organisation (WHO) formally recognised obesity as a global epidemic. As of 2005, the WHO estimated that at least 400 million adults (9.8%) are obese, with higher rates among women than men. As of 2008, the WHO claimed that 1.5 billion adults, 20 and older, were overweight and of these over 200 million men and nearly 300 million women were obese. The rate of obesity also increases with age upto 50 or 60 years. Once considered a problem only of high-income countries, obesity rates are rising worldwide. These increases have been felt most dramatically in urban setting. The only remaining region of the world where obesity is not common is the sub-Saharan Africa.[1]

Obesity is a complex condition involving biological, psychological, socio cultural. Important psychological factors influencing obesity are impulsivity, locus of food control and stress. Results suggest that overweight and obese person has higher level of Urgency, lack of Perseverance and sensitivity to Reward. A tendency to act impulsively is associated with a tendency to overeat.

It is proposed to study these three parameters along with biochemical parameters in obese individuals attending our hospital with the help of standard tools available for their assessment. This exploratory study is aimed to offer insight into the psychological causative factors of obesity.

AIMS AND OBJECTIVES:

1. To study biochemical profile of obese and overweight individuals.

2. To study behavioural aspects associated with obesity in these individuals, viz. Locus of food control, impulsivity and stress levels in these individuals.

3. To study any association amongst these parameters.

MATERIALS AND METHODS:

Study Design

- This prospective cross-sectional case-control study was conducted at Shree Krishna Hospital and Pramukhswami Medical College after an approval from the Human Research and Ethics Committee from January to October 2013.

- Recruitment was done from those individuals volunteering for Executive Health Check up scheme. All those who expressed voluntary consent and satisfy the inclusion and exclusion criteria were included in the study.

Inclusion criteria

- All individuals with age >18 years and BMI > 23 were included in the study as cases.
- Individuals with BMI of < 23, that is normal BMI, were taken as controls.

Exclusion Criteria

- Individuals suffering from Diabetes Mellitus, Hypertension, Ischemic Heart disease, Respiratory disease, Hepatic or Renal impairment.
- The study was carried out from obtaining a written permission from the institutional HREC.
- After obtaining the written consent, patients who presented for Executive Health Check up they were enrolled and a detailed evaluation was carried out.
- Detailed clinical and laboratory evaluation of all the individuals was carried out and their Body Mass Index (BMI) was calculated.
- 63 obese/overweight individuals and 49 normal weight individuals (control subjects) were evaluated for their behavioural profile as per the Performa and Questionnaires
- General Health Questionnaire
- Barratt Impulsiveness Scale 11
- Dieting Belief Scale (Stotland & Zuroff)

Clinical evaluation

- A detailed medical history of the patent including symptomatology, details of any past illnesses, occupation, illness in the family, habits or addictions (alcohol or smoking) and any other co morbid conditions were obtained.
- A complete physical and cardiovascular examination was performed.
- Blood pressure was measured with a mercury sphygmomanometer in a standardized fashion.

- Each patient's anthropometrical measurements were obtained. Height was recorded to the nearest centimetre without any footwear; weight was obtained on a regular weight scale and recorded to the nearest five hundred grams with the lightest of clothing. BMI was calculated in each of them. Waist circumference was measured at the smallest girth with a measure tape.

Biochemical Investigations

- Each patient in the study underwent laboratory investigations of FBS, Lipid profile and Serum creatinine.

Behavioural assessment

- The behavioural profile of each patient was evaluated with the help of three standard Performa/questionnaires:
- These were
- General Health Questionnaire
- Barratt Impulsiveness Scale 11
- Dieting Belief Scale (Stotland & Zuroff)

The profile perfomas were translated into regional language (Gujarati), and were retranslated and validated.

Statistical Analysis

- Statistical Analysis of the observations was done with a view to provide a logical support to the results and arriving at a better understanding of the study and its outcome.
- In our study, we have used different statistical tools to analyse our data. We have applied –

1. Descriptive analysis (mean, standard deviation, standard error of mean, confidence interval and range).

2. Cross table and frequency tables with percentage and applied Chi-Square test.

3. ANOVA (Analysis of Variance)

4. Karl Pearson Linear Correlation

- We have started with dividing the total population into Normal, Preobese and Obese according to their Body Mass Index (BMI).

- Another stratification done was according to their laboratory parameters, normal or abnormal and according to their behavioural profile.

- Various anthropometric parameters and biochemical parameters were compared in between the groups.

- Also, the behavioural parameters, i.e., locus of food control, impulsiveness and evidence of stress, were compared in between the groups and with each other behavioural and biochemical parameters.

- We had started with simple frequency distribution which gave us the basic information about various parameters (e.g. age, Blood pressure, BMI, waist circumference, etc.) used for anthropological assessment.

- This gave us mean values and ranges of the parameters in the total population, each group divided according to their antropometric, biochemical and behavioural factors.

- This was followed by the cross tabulation with Chi- Square tests, which is used to check the dependency and attributes between the two variables in a study.

- Lastly, we have applied Analysis of Variance (ANOVA) technique to check whether there is any significant difference between the different levels in different groups for anthropometric, biochemical and behavioural parameters.

- In each statistical test we have calculated the test value and the corresponding p-value. And the value was considered significant if it was less than 0.05.

RESULTS AND ANALYSIS

Graph 1.Demographic Results

Out of 112 patients studied, 49 (43.8%) had Normal BMI, 22 (19.6%) were Preobese and 41 (36.6%) were Obese.
This implies that more than 50 % were either Obese or Preobese.

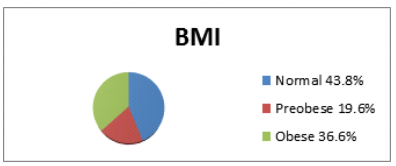
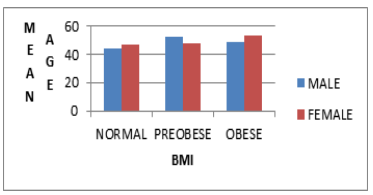


Table 1.Age Distribution

MEAN AGE OF PATIENTS

	MEAN AGE		
BMI	MALE	FEMALE	AVERAGE
NORMAL	44.33 ± 14.00	46.91 ± 13.99	45.62 ± 13.91
PREOBESE	52.44 ± 10.64	47.50 ± 10.88	49.97 ± 10.68
OBESE	48.59 ± 13.45	53.32 ± 12.56	50.95 ± 13.10
AVERAGE	48.45± 13.36	49.24 ± 12.48	48.84± 12.92

Graph 2 Mean age of patients

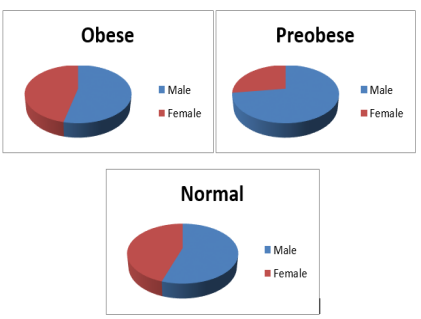


- Mean age of Male population in the study is 48.45 years while that of Female population is 49.24 years.
- Mean age of population with Normal BMI is 45.62 years, while that of Preobese population is 49.97 years and that of Obese population is 50.95 years.
- Mean age of the people from obese group is more than Preobese than Normal group of population.
- Also, females in Normal and Obese group were found to have slightly higher age than the Preobese group.

TABLE 2. Gender Distribution

BMI	MALE	FEMALE	TOTAL
NORMAL	27	22	49
PREOBESE	16	6	22
OBESE	22	19	41
TOTAL	65	47	112

Graph 3 :Gender distribution

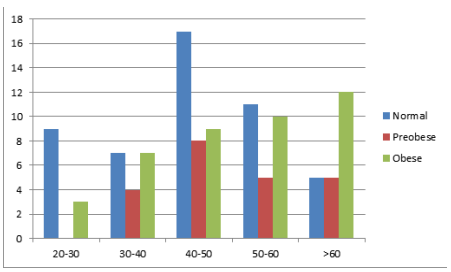


The study population was comprised of 58% males and 42% females who were part of Executive Health Check up programme at Shree Krishna Hospital, Karamsad.

Table 3 :Age Distribution according to BMI

BMI AGE	NORMAL	PRE OBESE	OBESE	TOTAL
20-30	9	0	3	12
30-40	7	4	7	18
40-50	17	8	9	34
50-60	11	5	10	26
>60	5	5	12	22
TOTAL	49	22	41	112

Graph 4:Age distribution according to BMI

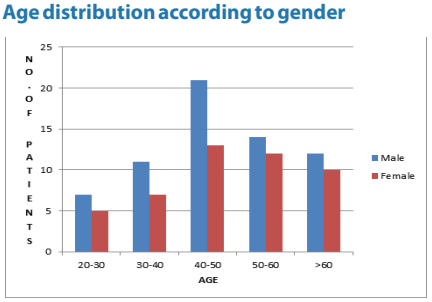


- The incidence of obesity in the age group 20 to 30 years was 25 %, 30 to 40 years was 38.9%, 40 to 50 years was 26.4%, 50 to 60 years was 38.4% and more than 60 years was 54.5%.
- Thus, incidence of obesity significantly increased with Age.
- 53.5 % of the total population of study was between the age group of 40 to 60 years out of which 17% were obese while 19.7% were less than 40 years and of which 9% were obese and 26.8% were more than 60 years of age, of which 19.6% were obese.

Table 4: Age Distribution according to Gender

AGE	GENDER		TOTAL
	MALE	FEMALE	
20-30	7	5	12
30-40	11	7	18
40-50	21	13	34
50-60	14	12	26
>60	12	10	22
TOTAL	65	47	112

Graph 5: Age distribution according to gender

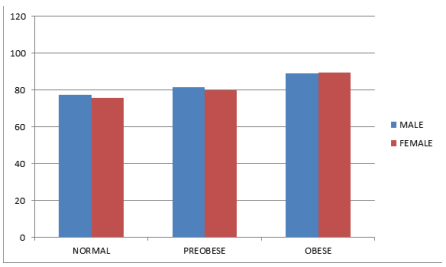


- Out of 58% males, 31% were between the age groups of 40-60 years while 23.2% were in the age group of >60 years, and that of <40 years was 16%.
- Out of 42% females, 22.3% were between the age groups of 40-60 years while 8.9% were in the age group of >60 years, and that of <40 years was 11.6%.

Table 5 :Waist circumference

BMI	WAIST CIRCUMFERENCE (cm)		AVERAGE
	MALE	FEMALE	
NORMAL	77.35 ± 5.83	75.55 ± 4.70	76.54 ± 5.37
PREOBESE	81.47 ± 6.05	79.83 ± 5.95	81.02 ± 5.93
OBESE	89.05 ± 7.18	89.31 ± 9.49	89.17 ± 8.22
TOTAL	82.62 ± 6.35	81.56 ± 6.71	82.24 ± 6.51

Graph 6:distribution according to waist circumference

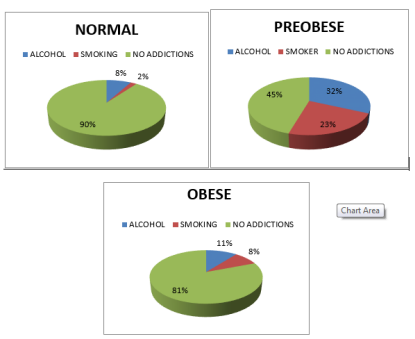


- Males: The average waist circumference in Normal, Preobese and Obese individuals was 77.35 ± 5.83, 81.87 ± 6.05 and 89.05± 7.18 cm, respectively.
- Females: The average waist circumference in Normal, Preobese and Obese individuals was 75.55 ± 4.40, 79.83 ± 5.95 and 89.39± 9.49 cm, respectively.
- These differences are significant.

Table 6: ADDICTIONS

BMI	ALCOHOL	SMOKER	TOTAL
NORMAL	4	1	5
PREOBESE	7	5	12
OBESE	5	4	9
TOTAL	14	10	24

Graph 7: distribution according to addiction



- 21.4% of the study population had addictions, of which 12.5% were alcoholics while 8.9% were smokers.
- There was no correlation between the addiction with either the laboratory parameters or the behavioural scores.

The fisher exact test p value was 0.18 for GHQ with addictions.
The fisher exact test p value was 0.78 for BIS with addictions.
The p value for DBS with addictions was 0.8, all suggesting no correlation.

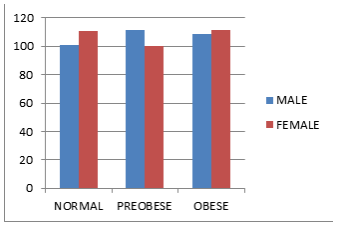
Laboratory parameters

Table 7 :FBS distribution

BMI	MALE	FEMALE	AVERAGE
NORMAL	100.63 ± 14.86	110.77 ± 68.93	105.18 ± 47.16
PREOBESE	111.38 ± 31.50	100.5 ± 10.76	108.41 ± 27.59
OBESE	108.5 ± 26.67	111.58 ± 27.54	109.93 ± 26.78
AVERAGE	106.84 ± 24.34	107.62 ± 35.74	107.22 ± 33.84

BMI FBS	NORMAL	PRE OBESE	OBESE	TOTAL
NORMAL	44	17	31	92
ABNORMAL	5	5	10	20
TOTAL	49	22	41	112

Graph 8: distribution according to FBS



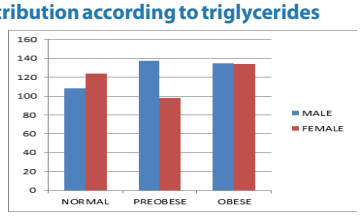
- Out of 112 patients, 20 patients had FBS more than 110 mg/dl, of which 5 were in Normal and Preobese group and 10 in Obese group.
- Thus, 25% of obese individuals had sugar more than 110 mg/dl.
- But, the difference between all the three groups was statistically insignificant.

Table 8: Triglycerides

BMI	TG		AVERAGE
	MALE	FEMALE	
NORMAL	108.19 ± 63.33	124.14 ± 70.40	115.35 ± 66.37
PREOBESE	137.38 ± 69.98	98 ± 34.29	126.64 ± 64.04
OBESE	134.64 ± 56.32	134 ± 84.42	134.34 ± 69.81
TOTAL	126.73 ± 63.21	118.71 ± 63.03	122.72 ± 66.74

BMI TG	NORMAL	PRE OBESE	OBESE	TOTAL
<150	39	16	29	84
>150	10	6	12	28
TOTAL	49	22	41	112

Graph 9: distribution according to triglycerides



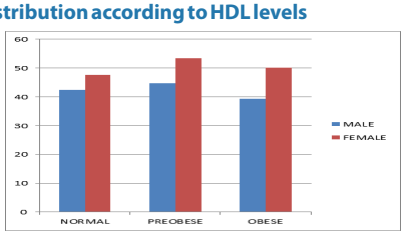
- No significant difference in Serum TG was found while comparing the three groups. No significant difference due to gender was present. In this study population, the average TG levels were higher in Obese group than the others.
- Males have higher levels of TG than the females.

Table 9 HDL levels

BMI	MALE	FEMALE	AVERAGE
NORMAL	42.33 ± 12.17	47.55 ± 12.34	44.67 ± 12.39
PREOBESE	44.75 ± 9.84	53.5 ± 13.30	47.14 ± 11.28
OBESE	39.27 ±10.98	50.10 ± 16.36	44.29 ± 14.61
AVERAGE	42.11 ± 11	50.38 ± 14	45.36 ± 12.76

BMI HDL	NORMAL	PRE OBESE	OBESE	TOTAL
<35	8	3	12	23
>35	41	19	29	89
TOTAL	49	22	41	112

Graph 10: distribution according to HDL levels



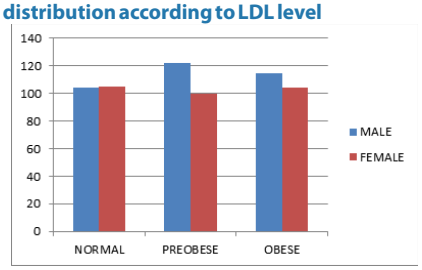
- 20.5% of the study population had HDL less than 35 mg/dl, of which 10.7% were obese while 25.9% had normal HDL.
- No significant difference in Serum HDL levels was found while comparing the three groups. No significant difference due to gender was present.

Table 10: LDL

BMI	LDL		AVERAGE
	MALE	FEMALE	
NORMAL	103.84 ± 32.59	104.61 ± 30.91	104.18 ± 31.52
PREOBESE	122.19 ± 21.35	100.0 ± 11.60	116.14 ± 21.45
OBESE	114.95 ± 21.66	104.43 ± 25.45	110.07 ± 23.79
TOTAL			

BMI LDL	NORMAL	PRE OBESE	OBESE	TOTAL
<100	24	6	15	45
100-129	16	10	16	42
>130	9	6	10	25
TOTAL	49	22	41	112

Graph 11 distribution according to LDL level

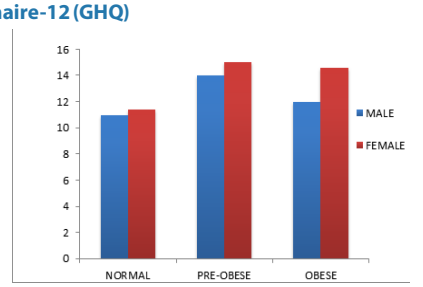


- The levels of LDL were found to be higher in Preobese and obese males than in females of the same group. However, the difference was not significant. No significant difference due to gender was present.

Table 11:distribution according to General Health Questionaire-12 (GHQ)

	GHQ		
	MALE	FEMALE	AVERAGE
NORMAL	10.93 ± 3.31	11.36 ± 4.15	11.12 ± 3.68
PREOBESE	14 ± 4.81	15 ± 8.0	14.27 ± 5.65
OBESE	12 ± 5.61	14.16 ± 6.21	13.00 ± 5.92
AVERAGE	12.30	13.50	12.90

Graph 12 : distribution according to General Health Questionaire-12 (GHQ)



GHQ	NORMAL	PREOBESE	OBESE	TOTAL
< 15	40	13	22	75
15-20	8	6	14	28
>20	1	3	5	9
TOTAL	49	22	41	112

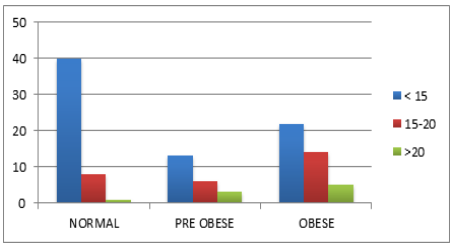


Table 12 GHQ ACCORDING TO AGE GROUP

AGE GHQ	20-30	30-40	40-50	50-60	>60	TOTAL
<15	9	10	27	19	10	75
15-20	3	6	7	4	8	28
>20	0	2	0	3	4	9
TOTAL	12	18	34	26	22	112

Graph13 GHQ according to age group

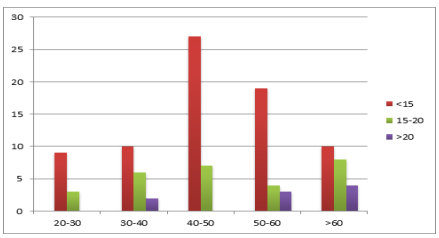
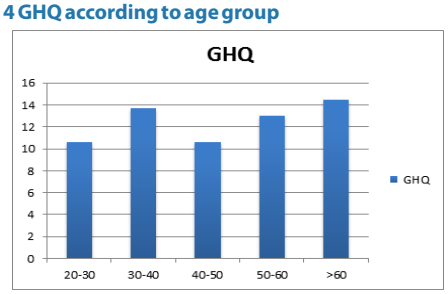


Table 13 GHQ (AVG) ACCORDING TO AGE GROUP

AGE	20-30	30-40	40-50	50-60	>60	AVG.
GHQ	10.58	13.72	10.61	13.03	14.45	12.90

Graph 14 GHQ according to age group



- The average score of the General Health Questionnaire 12 of the Normal, Preobese and obese group was 11.12 ± 3.68, 14.27 ± 5.65 and 13.00 ± 5.92, respectively.
- The average GHQ score of the Preobese was higher than the obese.
- Within the Obese individuals, the score was higher in obese females than the males of the same group.
- 25% of the study population was having a score 15 to 20 suggestive of evidence of some psychological distress, out of which 12.5% were Obese.
- 8% of the total population had a score of more than 20 suggestive of severe psychological distress, of which 4.46% were obese.
- The GHQ score was higher in population with age group of more than 60 years and slightly higher in age group 30 to 40 years.
- There was a weak positive correlation between GHQ score and age (p value <0.05), suggesting that as age increases, the level of stress increases. No correlation between GHQ score and BMI.

Table 14 :DBS ACCORDING TO BMI AND AGE

AGE BMI	NORMAL	PRE OBESE	OBESE	TOTAL
<74	41	20	33	94
>74	8	2	8	18
TOTAL	49	22	41	112

Graph 15: according to BMI and age

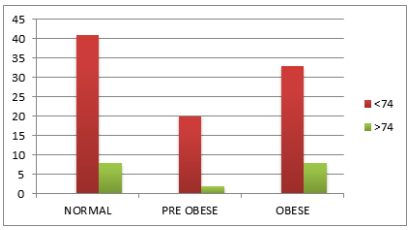
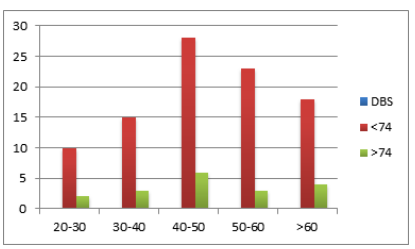


Table 15 according to locus of food control

AGE DBS	20-30	30-40	40-50	50-60	>60	TOTAL
<74	10	15	28	23	18	94
>74	2	3	6	3	4	18
TOTAL	12	18	34	26	22	112

Graph 16: locus of food control



- Locus of Food Control: 83.9% of the study population had Internal locus of food control and 16.1% had External locus of food control.
- Out of those who had Internal locus of food control, 29.5%, 17.9% and 36.6% were Obese, Preobese and Normal, respectively.
- 25% of the population with internal locus of food control were in the age group of 40 to 50 years, while 20.5% in 50 to 60 years and 16.1% were in age more than 60 years.
- 16.1% had External locus of food control, of which 7.1% were obese.
- 5.35% of the population with internal locus of food control were in the age group of 40 to 50 years, while 2.7% in 50 to 60 years and 3.6% were in age more than 60 years.
- There was no significant correlation between Dieting belief scale with age or BMI.

Table 16: BARATT IMPULSIVENESS SCALE

BMI	BIS-11		AVERAGE
	MALE	FEMALE	
NORMAL	62.55 ± 10.1	62.55 ± 9.0	62.55 ± 9.5
PRE OBESE	65.81 ± 12.2	68.67 ± 9.4	67.23 ± 11.4
OBESE	64.90 ± 11.4	66.15 ± 8.8	65.52 ± 10.2
AVERAGE	64.42 ± 11.2	65.78 ± 9.1	65.10 ± 10.5

Graph17 : BARATT IMPULSIVENESS SCALE

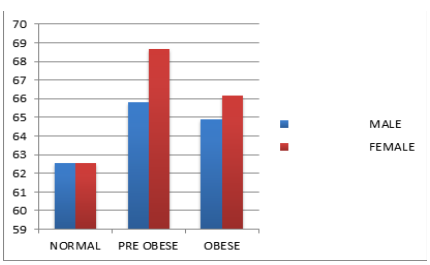
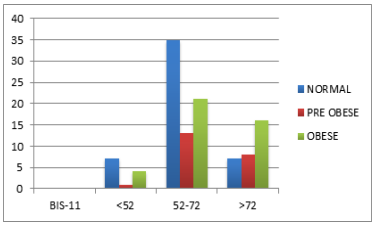


Table 17 BIS-11 SCORE ACCORDING TO BMI

BMI BIS-11	NORMAL	PRE OBESE	OBESE	TOTAL
<52	7	1	4	12

52-72	35	13	21	69
>72	7	8	16	31
TOTAL	49	22	41	112

Graph 18: BIS-11 SCORE ACCORDING TO BMI

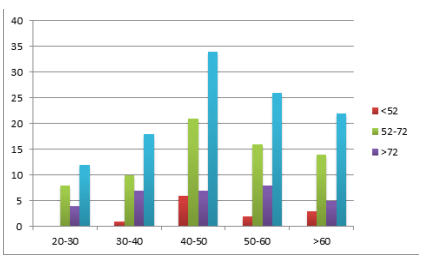


- The mean score of normal weight group was 62.55, while that of Preobese was 67.23 and that of the obese group was 65.52.
- 27.7% of the study population were found to be Impulsive, out of which 51.6 % were obese.
- 61.6 % were found to be with Normal Impulsiveness, out of which 30.4% were Obese.
- 10.7% were found to be extremely over controlled, out of which 20% were Obese.

Table 18 :BIS-11 SCORE ACCORDING TO AGE GROUP

AGE BIS11	20-30	30-40	40-50	50-60	>60	TOTAL
<52	0	1	6	2	3	12
52-72	8	10	21	16	14	69
>72	4	7	7	8	5	31
TOTAL	12	18	34	26	22	112
AVERAGE	66.08 ± 10.1	66.05 ± 11.3	60.17 ± 10.8	63.11 ± 8.5	63.77 ± 10.6	63.83

Graph 19: BIS-11 SCORE ACCORDING TO AGE GROUP



- The mean BIS score was found to be higher in population with age group less than 40 years.
- There was no significant correlation between BIS scale with age or BMI.

Table 19:LABORATORY PARAMETERS AND SCORES FBS

SCORE FBS	GHQ	DBS	BIS-11
NORMAL	12.26	65.33	63.31
ABNORMAL	13.2	65.65	66.45

Graph 20: LABORATORY PARAMETERS AND SCORES FBS

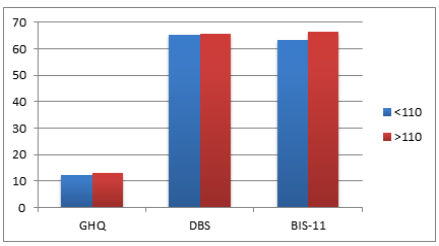


Table 20 :TG and scores

SCORE TG	GHQ	DBS	BIS-11
<150	12.55	64.90	64.45
>150	12.03	66.85	64.32

Graph 21:TG and scores

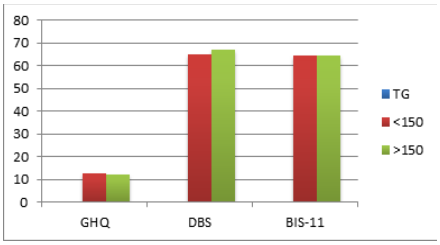
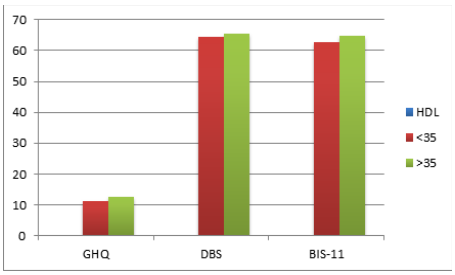


Table 21:HDL and score

SCORE HDL	GHQ	DBS	BIS-11
<35	11.21	64.52	62.86
>35	12.74	65.61	64.82

Graph 22 :HDL and score



- There was no significant association found between the laboratory parameters and the behavioural factor scores.

Table 22 CORRELATION OF GHQ SCORE WITH LABORATORY AND OTHER BEHAVIOURAL PARAMETERS

GHQ	FBS	CHOL.	TG	HDL	LDL
<15	108.74 ± 41.7	177.98 ± 36.5	124.49 ± 64.1	45.12 ± 13.2	106.98 ± 28.8
15-20	101.32 ± 20	181.07 ± 31.3	125.28 ± 81.7	43.32 ± 12.8	112.61 ± 24.5
>20	117 ± 36.1	185 ± 33.6	122.33 ± 44.7	49.44 ± 11.2	110.68 ± 22.5

Graph 23: CORRELATION OF GHQ SCORE WITH LABORATORY AND OTHER BEHAVIOURAL PARAMETERS

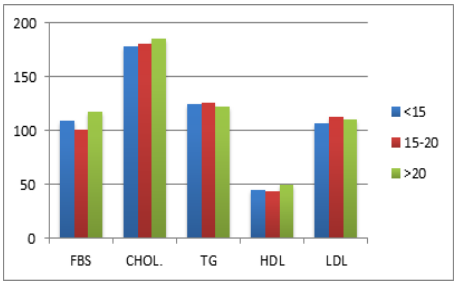
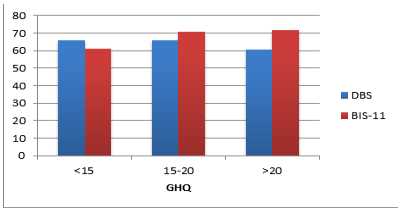


Table 23 :correlation of various scores

GHQ	DBS	BIS-11
<15	65.85 ± 7.6	61.22 ± 7.4
15-20	65.64 ± 8.4	70.67 ± 9.6
>20	60.77 ± 9.6	71.55 ± 8.4

Graph 24: correlation of various scores



- There was no significant correlation found between GHQ score/stress levels with the laboratory parameters.
- There was a weak positive correlation of GHQ score with BIS score (p value < 0.05).

Table 24 CORRELATION OF DBS SCORE WITH LABORATORY AND OTHER BEHAVIOURAL PARAMETERS

DBS	FBS	CHOL.	TG	HDL	LDL
<74	108.03 ± 39.9	177.91 ± 36.1	123.63 ± 68.2	45.07 ± 13.4	107.32 ± 27.1
>74	105.05 ± 13.8	186.66 ± 26.9	129.11 ± 63.1	44.72 ± 10.6	115.78 ± 27.6

Graph 25 CORRELATION OF DBS SCORE WITH LABORATORY AND OTHER BEHAVIOURAL PARAMETERS

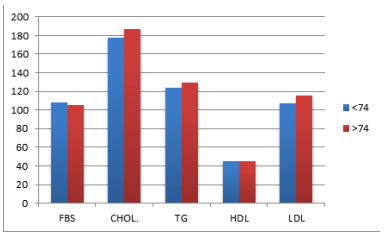
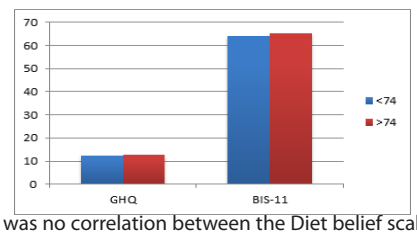


Table 25:correlation of DBS with other scales

DBS	GHQ	BIS-11
<74	12.38 ± 5.2	64.28 ± 10.6
>74	12.66 ± 4.8	65.11 ± 8.3

Graph 26 : correlation of DBS with other scales



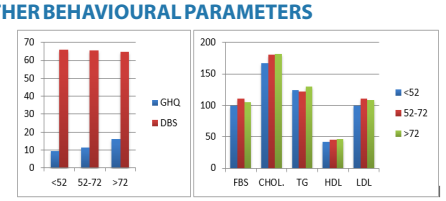
- There was no correlation between the Diet belief scale with all the laboratory parameters and with the other behavioural factor scores.

Table 26 CORRELATION OF BIS SCORE WITH LABORATORY AND OTHER BEHAVIOURAL PARAMETERS

BIS-11	FBS	CHOL.	TG	HDL	LDL
<52	99.5 ±20.5	167 ± 23.9	123.75 ± 38.8	42.33 ± 11.1	99.78 ± 22.9
52-72	110.34 ± 43.1	180.24 ± 34.9	122.07 ± 65.8	45.05 ± 12.1	110.52 ± 28.4
>72	104.45 ± 25.3	182.03 ± 38.2	130.25 ± 79.1	45.96 ± 15.5	108.04 ± 25.9

BIS-11	GHQ	DBS
<52	9.58 ± 2.8	65.91 ± 7.5
52-72	11.33 ± 4.8	65.62 ± 8.1
>72	15.96 ± 4.8	64.67 ± 8.3
AVG.	12.29	65.40

Graph 27 : CORRELATION OF BIS SCORE WITH LABORATORY AND OTHER BEHAVIOURAL PARAMETERS

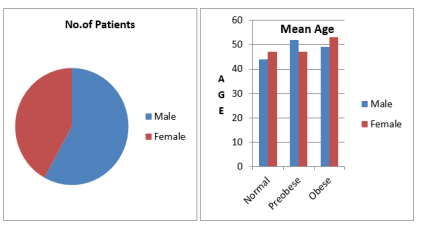


- The average Cholesterol and TG levels were higher in the group with DBS more than 72, suggesting impulsive behaviour, than in other groups, also the average GHQ score was higher in impulsive people.
- There was no significant association between the Barratt impulsiveness scale and all the laboratory parameters.

There was a weak positive correlation between BIS scale and GHQ score (p value < 0.05) suggesting that with increase in the impulsiveness score, the stress level score increases.

Discussion

A: Age, Gender and BMI



The above figures shows that male population is more in number than the females. The Obese group were older than the other groups. In the obese group, females were older than the males. The mean age of the obese group was higher than the normal and the Preobese group. Literature says that the prevalence of obesity was higher in females in developing countries due to their sedentary lifestyle. Also, the age standardised prevalence of overweight was higher in women, than in men in many developing countries including China, Iran and Srilanka. Male sex is an independent risk factor for development of coronary heart disease and it forms the non modifiable risk factor.1

The average BMI in our study was 25.55, while that of the male population was 25.5 and females was 25.6. The average BMI of males was slightly higher than in the females except for the age group between 50 to 60 years, where BMI in females was higher than males.

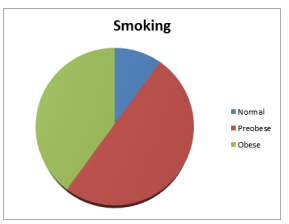
Prevalence of Obesity (%)

Author & year	Male	Female
Gupta et al. 2003	21.8	44
Misra et al. 2001	13.3	15.6
Gupta et al. 2004	25.6	44
Prabhakaran et al.2005	35	43
Deepa et al.2007	43.2	47.4
Our study	19.6	16.9

In our study, males were 58% while the females were 42 %. Out of 58% males, 31% were between the age groups of 40 to 60 years while 23.2% were in the age group of more than 60 years, and that of less than 40 years was 16%. And out of 42% females, 22.3% were between the age groups of 40-60 years while 8.9% were in the age group of more than 60 years, and that of less than 40 years was 11.6%. This suggests that the older age population had participated in the study more than the younger age group; this can be explained by the fact that as age advances, they are liable to get many diseases. And due to the awareness in the society and the person's concern for his health, most of the person coming for health check up in our hospital is of age group more than 40 years.

Also, there was no correlation between the waist circumference and all the biochemical or behavioural factors.

Smoking and BMI

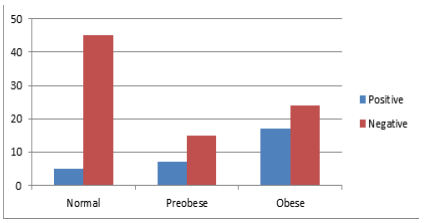


Only 8.92% of the study had addiction for Smoking, of which half were Preobese. Smoking was done only by males in this study.

There was no significant correlation, positive or negative, in our study between smoking and the biochemical and behavioural parameters p value was more than 0.05).

WHO data on tobacco usage in Gujarat is 25% for both, tobacco chewing and smoking.[2]

Family history



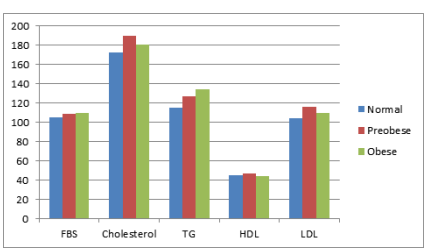
25.9% of the population in study had family history of Hypertension, Diabetes Mellitus type 2 or Ischemic Heart Disease, of which 15 % were Obese.

Sande et al in 2001 noticed that those with a family history of obesity had a higher BMI and were at increased risk of obesity. A family history of hypertension, obesity, diabetes, or stroke was a significant risk factor for obesity and dyslipidemia, as there was a strong correlation between family history and . And with increase of age, more pathological manifestations can develop in this high-risk group.3

But in our study, there was no such correlation between family history and BMI/biochemical parameters. This could be due to smaller size of the population in the study. Demography and the ethnicity of the study population were different from our study.

Also, there was no correlation between the family history and the behavioural factors in the study (Pearson coefficient value- 0.37, 0.57 and 0.63 for GHQ, BIS and DBS, respectively).

B. Biochemical Parameters



In this study, the FBS, serum triglyceride, cholesterol and LDL were slightly higher in Preobese and Obese than the Normal subjects.

But there was no statistically significant correlation of these laboratory parameters and the groups.

Also when the population was divided according to each of the laboratory, anthropological parameters or the behavioural factors, there was no significant correlation between them.

High serum lipid levels and FBS are a major risk factor for coronary heart diseases and other vascular diseases that are influenced by lifestyle transition and urbanisation. Limited information exists regarding the changing time trends in lipid levels and the prevalence of dyslipidemia in Indian subjects. A study in urban Kerela reported 32% prevalence during 1999, and two studies from Andhra Pradesh published in 2002 reported 18.5% and 31% prevalence of hypercholesterolemia respectively.

Prasad et al in June 2013 conducted a study in Eastern India and noticed that compared to the WHO standard cut-off criteria of overweight [BMI ≥25 kg/m(2)] and obesity [BMI >30 kg/m(2)], the cardio metabolic risk factors studied showed a significant incremental rise even with the lower cut-offs of the revised Asia-Pacific criteria. Older age, female gender, family history of diabetes, being hypertensive, hypertriglyceridemia, hypercholesterolemia, physical inactivity and middle to higher socioeconomic status significantly contributed to increased obesity risk among this urban population.4

Correlations between different parameters –

1. BMI with FBS and Lipids

An Indian study done in Karnataka by Vittal B.G and colleagues in 2010 did a study of Body Mass Index in Healthy Individuals and Its Relationship with Fasting Blood Sugar noticed a positive correlation was observed (Pearson's correlation coefficient r = + 0.26) between BMI and FBS. There was a stepwise increase in the magnitude of BMI with an increase in age in decades. Although the increase in mean FBS was observed with age, a statistically significant (p = 0.00093) increase in mean FBS was observed only in the 4th decade of life.[5]

Another study conducted in Karnataka by Itgappa Maliyannar and colleagues on 2012 to find out any Correlation between Body Mass Index with Fasting Blood Sugar and Lipid Profile in Young Adult College Students of South Indian Population observed that compared to male and female the fasting blood sugar, Cholesterol, LDL and triglycerides levels are higher and significant in female than male. This result indicates females are more prone to develop cardiovascular diseases.[6]

BMI is a good measure of adiposity; however, the relationship between actual body fat and BMI differs between ethnic groups, and as a consequence, the cut off points for the overweight status and obesity based on BMI, will have to be ethnicity specific.

Another study conducted by Raju G.M. And colleagues to study the relation of BMI with Fasting Blood Sugar and Triglycerides Level in Healthy Young Adult Medical Students also showed that females and males having over weighted and the fasting blood sugar and triglycerides are more in females than males. The coefficient of correlation between FBS and BMI was 0.41 and that between BMI and TG was 0.41, with p value of <0.015,i.e.,significant correlation was observed between both the variables.[7]

In our study, there was no positive correlation between BMI with any of the laboratory parameters.

2. FBS with Lipid profile

In our study, there was no correlation between FBS and Lipid profile.

FBS	Pearson correlation value			
	Cholesterol	TG	LDL	HDL
	0.21	0.25	0.19	-0.1

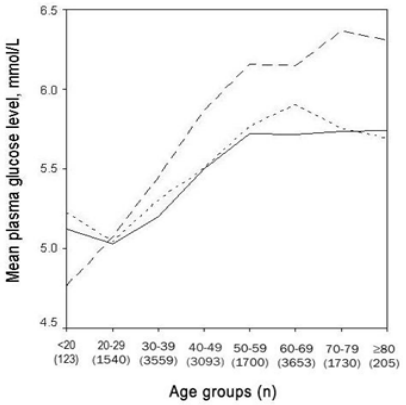
3. Age with FBS and lipid profile

Hardev Singh Sandhu and colleague in 2008 compared the relation between age group with lipid profile and the results indicated that in females, statistically negatively significant correlation (r = - 0.26) was found in LDL – C in age group 41 – 50 years and in males of the same age group, positively significant correlations were noted in serum cholesterol (r = 0.48), LDL – C (r = 0.35) and in triglyceride (r = 0.35) and also in age group 61+ years positively significant correlations were found in males between waist to hip ratio and triglyceride (r = 0.60).[8]

Gary TC Ko analysed effects of age on plasma glucose levels in non-diabetic Hong Kong Chinese Plasma glucose levels progressively increase with age in Hong Kong Chinese non-diabetic subjects.[9]

Yamamoto K and colleagues that age is a predictor for an increase in glycated hemoglobin, FBS, body fat percentage, and triglyceride concentration were not unexpected as the prevalence of obesity

and being overweight was observed to increase according to an increase in age among the population of 20 to 69 years-olds for both men and women.[10]



The Pearson coefficient of correlation calculated in our study was –

This suggests that in our study, there was no significant correlation between Age with FBS and the lipid profile. The p value was not significant.

4. Smoking with FBS and Lipid Profile

It is a known fact that smoking causes dyslipidemia.

Sinha AK and colleagues in 1995 conducted a study in 40 healthy young male Cigarette smokers and 40 age and weight matched male non smokers, to find out the difference in the serum lipid profiles of both the groups. The mean serum total cholesterol (177.3 +/- 32.5 mg/dL) and LDL cholesterol (100.2 +/- 31.0 mg/dL) were significantly higher in smokers ($p < 0.05$) whereas mean serum HDL-Cholesterol was (43.2 +/- 5.8 mg/dL) was significantly lower ($P < 0.05$). Mean triglyceride (170.8 +/- 59.7 mg/dL) was significantly higher in smokers than in non-smokers ($p < 0.01$). In the fed state the total serum cholesterol level and triglyceride level was increased by 10.4 mg/dL and 51.1 mg/dL respectively in smokers whereas the increase was 4.8 mg/dL and 24.3 mg/dL respectively in nonsmokers. There was less rise of HDL cholesterol (1.9 mg/dL) in smokers as compared to that in non-smoker (3.4 mg/dL) and in LDL-cholesterol (1.8 mg/dL) in smokers compared to non-smokers (3.4 mg/dL) in fed state.11

A study conducted by Khurana M in 2000 in Jaipur showed that High density lipoprotein-cholesterol was lower both in smoker ($P < 0.01$) as well as in tobacco chewers ($P < 0.001$) than the controls. Both smokers and tobacco chewers had higher values of total cholesterol, low density lipoprotein cholesterol, very low density lipoprotein-cholesterol and, triglycerides as compared to non-smoker, non-tobacco chewer group.12

Another study conducted in Japan by Yamamoto K and colleagues in 2011 had studied the relationship between Smoking and FBS and he noted that Stress score, age, BMI, and alcohol consumption were found to be associated with an increase in FBS among men, while smoking and exercise habits were associated with a decrease in FBS.[13]

But in our study, there was no such correlation between these two biochemical parameters with the smoking. This might be due to less number of participants who were smoker than the non smokers.

Correlation between BMI with the behavioural parameters: GHQ, BIS and DBS A study done by Kazuhiko Yamamoto in 2007 to see the relationship of stress score with BMI and various biochemical parameters found that stress intolerance score was significantly associated with body fat percentage among men, while it was significantly associated with body weight, BMI, and body fat percentage among women . It also showed that the body fat percentage among men and the BMI among women tended to increase with an increase in the stress intolerance score. There was a linear relationship between the stress intolerance score and body fat percentage among men (p 0.015). There was also a linear relationship between the stress intolerance score and body weight or BMI or body fat percentage among women (p 0.003, p 0.002 and p 0.017, respectively). But here the stress score used was IMPS and not GHQ.[10]

There was no study available for comparison.

Correlation of BMI with behavioural parameters in our study:

BIS	Pearson Correlation	.123
	Sig. (2-tailed)	.198
	N	112
DBS	Pearson Correlation	.085
	Sig. (2-tailed)	.371
	N	112
GHQ	Pearson Correlation	.183
	Sig. (2-tailed)	.053
	N	112

5. Correlation between Age with the behavioural parameters: GHQ, BIS and DBS

AGE		GHQ	DBS	BIS
GHQ	Pearson Correlation	1	-.237(*)	.468(**)
	Sig. (2-tailed)		.012	.000
	N	112	112	112
DBS	Pearson Correlation	-.237(*)	1	-.044
	Sig. (2-tailed)	.012		.646
	N	112	112	112
BIS	Pearson Correlation	.468(**)	-.044	1
	Sig. (2-tailed)	.000	.646	
	N	112	112	112

In our study we have observed that there was a weak positive correlation between Age and GHQ suggesting that the stress level increases as the age advances.

6. Interrelationship of GHQ, DBS and BIS

There was no data or study available regarding the interrelationship between these behavioural factors for comparison.

		BIS	GHQ	DBS
BIS	Pearson Correlation	1	.468(**)	-.044
	Sig. (2-tailed)		.000	.646
	N	112	112	112
GHQ	Pearson Correlation	.468(**)	1	-.237(*)
	Sig. (2-tailed)	.000		.012
	N	112	112	112
DBS	Pearson Correlation	-.044	-.237(*)	1
	Sig. (2-tailed)	.646	.012	
	N	112	112	112

In our study there was a weak positive correlation between the Barratt impulsiveness score with the GHQ score (Pearson correlation 0.468).

Also we noticed a weak negative correlation between the GHQ score with the DBS score (Pearson correlation -0.237).

C: As it can be seen from the above discussion

Basically, the disease is a reflection of abnormal physiological or pathological state. It can start with mind not able to cope up with milieu exterior (life style, food habits, situational stress, etc. This

implies that the psychological abnormalities should precede biochemical and anthropometric abnormalities. It may not be necessarily so, given the complexities of mind body interactions.

D: Characteristics of Obese individuals

1. Age distribution

Age	Obese
20-30	3
30-40	7
40-50	9
50-60	10
>60	12
Total	41

Out of 41 obese persons, 29% were of age more than 60 years while 24%, 22% and 25% were in the age group of 50 to 60 years, 40 to 50 years and less than 40 years respectively.
It is known that as the age advances the BMI increases, this is due to the sedentary life of the elder population.

2. Gender distribution

BMI	MALE	FEMALE	TOTAL
OBESE	22	19	41

In this study, out of 41 obese, 22 (53.6%) were male while 19 (46.4%) were females. In this study, male obese were found to be more in numbers than the females.

This suggests higher prevalence of Obesity in developing countries like India.

Many studies and survey have shown higher prevalence of Obesity in Urban population than in the rural population.

3. Mean biochemical values

Obese	FBS	CHOL.	TG	HDL	LDL
Male	108.5 ± 26.67	181.5 ± 12.2	134.64 ± 56.32	39.27 ±10.98	114.95 ± 21.66
Female	111.58 ± 27.54	181.4 ± 14.5	134 ± 84.42	50.10 ± 16.36	104.43 ± 25.45
Mean	109.93 ± 26.78	181.45 ± 13.4	134.34 ± 69.81	44.29 ± 14.61	110.07 ± 23.79

The mean FBS was slightly higher in the females than in the males in the obese group. This suggests that the females had higher tendency to develop diabetes mellitus or impaired glucose tolerance than the males.

The HDL levels were found to be higher in the females than in the males. Also the LDL levels were higher in males than in females. This can suggest higher risk of male population to develop any cardiovascular event than in the females, in this study.

4. Psychological score:

Obese	GHQ	DBS	BIS
Male	12 ± 5.61	68.77 ± 7.928	64.90 ± 11.4
Female	14.16 ± 6.21	64.89 ± 7.608	66.15 ± 8.8
Mean	13 ± 5.92	66.98 ± 7.929	65.52 ± 10.2

In the Obese group of population, the average score of the GHQ and BIS score was higher in females than in males, while the DBS, the score was higher in males, suggesting that in this study, the females had more impulsive behaviour than the males. And the females had higher stress levels than the males. Also the males had more of external locus of food control than the females.

The observations in the Obese subgroup of patients reveal that apart from age related increase in stress levels, no significant abnormality was observed in biochemical or psychological profile.

Conclusions

1. Incidence of obese, pre obese (overweight) and normal in the patient studied was 36.6%, 19.6% and 43.8 % respectively.
This indicates that a higher incidence of obesity in this cross sectional study.

2. Age and gender distribution of obese, overweight and non-obese. 58.03 % were males and 41.97% were females. Of which, 24.1% and 19.65% were normal weight males and females, respectively. 14.29% and 5.36% were Preobese/overweight males and females, respectively. 19.64% and 16.96% were Obese males and females respectively.

3. The mean values for FBS of Normal, Preobese and Obese were 105.18 ± 47.16, 108.41 ± 27.59 and 109.93 ± 26.78 respectively.

4. The mean values for TG of Normal, Preobese and Obese were 115.35 ± 66.37, 126.64 ± 64.04 and 134.34 ± 69.81 respectively.

5. The mean values of LDL of Normal, Preobese and Obese were 104.18 ± 31.52, 116.14 ± 21.45 and 110.07 ± 23.79 respectively.

6. The mean values of GHQ scores of Normal, Preobese and Obese were 11.12 ± 3.68, 14.27 ± 5.65 and 13.00 ± 5.92 respectively.

7. The mean values of BIS score of Normal, Preobese and Obese were 62.55 ± 9.5, 67.23 ± 11.4 and 65.52 ± 10.2 respectively.

8. The mean values of DBS score of Normal, Preobese and Obese were 64.67 ± 8.4, 64.05 ± 7.4 and 66.98 ± 7.9 respectively.

9. Lipid abnormalities were observed in 36.61 % of patients. Its correlation with Age, Gender and BMI was found to be non significant.
.

10. There was no correlation of BMI with FBS, Age, Gender, and Lipid profile.

11. There was no correlation of Smoking with biochemical/psychological parameters.

12. There was no correlation of BMI and gender with any of the three psychological parameters.

13. There was mild correlation between age and GHQ indicating that the stress level increases with age.

14. There was no correlation between abnormalities of any psychological parameter indicating a well groomed behaviour or composure in the patient studied and analysed for three different psychological parameters.

Thus, the present study shows no association physical, biochemical and psychological parameters in normal, pre obese and overweight individuals who volunteer for health check up.

15. There is also no specific abnormality detected among the very obese w.r.t physical, biochemical and psychological parameters.

16. Among those who had abnormal biochemical profile there was no significant difference in their physical and psychological profile.

17. There was no difference in physical and biochemical profile in those who had abnormal psychological profile.

18. The incidence of individuals having abnormal physical profile was 36.6%, those having abnormal lipid profile were 25%, abnormal FBS was 17.86% and those having abnormal psychological profile were 8.04% for GHQ, 16.07% for DBS and 27.68% in BIS 11 score and as described above no consistent patterns of association were observed among each other.

19. There is no definable abnormality (biochemical and

psychological) in very obese individuals.

20. There are studies describing abnormalities in psychological profile in general population. However we failed to come across even a single study which has compared all three parameters together. Incidence of various psychological abnormalities in Obese, Pre obese and Normal health individuals could not be confirmed on the basis of these parameters.

21. 80% of the patients had Locus of Internal Food control while 20 % had locus of food control.

In summary,

- The anthropometric profile of patients studied revealed that incidence of Obesity and Preobesity was higher (56%).
- Biochemical profile of the patients revealed that Normal, Preobese and Obese had no significant difference in their biochemistry and was essentially normal.
- Psychological profile of the patients studied revealed that 80% of patients had their Locus of food control External, 28% had mild stress, 8% had severe depression, and 14.2% were Impulsive.
- Statistical analysis revealed that there was no statistical correlation between BMI and Biochemical and Psychological parameters.
- Weak correlation between age and psychological stress was observed.
- Subgroup analysis of Obese individuals revealed no biochemical abnormalities, i.e. these obese individuals were metabolically normal.

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