BODY COMPOSITION ANALYSIS OF POSTGRADUATE STUDENTS USING BIOELECTRICAL IMPEDANCE ANALYSIS METHOD AND THEIR COUNSELING ON DIET AND LIFESTYLE

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ABSTRACT

Bioelectrical impedance analysis (BIA) is a commonly used method for estimating body composition, and in particular body fat. Since the advent of the first commercially available devices in the mid-1980s the method has become popular owing to its ease of use, portability of the equipment and it's relatively low cost compared to some of the other methods of body composition analysis.

Present paper deals with body composition analysis of postgraduate students using bioelectrical impedance analysis method and their counseling on diet and lifestyle. Bioelectrical impedance analysis method involves determination of Body Weight, Body Fat Percentage, Segmental Subcutaneous Fat Percentage (Whole Body, Trunk, Arms and Legs), Visceral Fat percentage, Segmental Skeletal Muscle Percentage (Whole Body, Trunk, Arms and Legs), Resting Metabolism, Body Mass Index and Body Age. Results are interpreted in terms of ideal weight, overweight, underweight, Period required for weight Loss / Gain at the rate of 1.5 kg per month, Period required for wt maintenance, Fat %, Subcutaneous Fat % (Trunk), Visceral Fat %, Skeletal Muscle % (Whole body), RM, BMI, Body Age. It also highlights correct weight reduction and instructions for better health improvement and weight loss, weight gain and weight maintenance programme.

For ideal weight management and for a more accurate and precise body composition analysis full Body Sensing Technology Karada Scan Body Composition Monitor – HBF-375 is used. Karada Scan measures body resistance by using weak current flowing through both hands and both feet (Bioelectrical Impedance / Biological resistance method). Tissues with more water content in human body tend to conduct electricity (such as muscle and vein) easily. Fat tissue almost conducts no electricity. The body feature is used to calculate percentage of fat tissue and non fat tissue. Current flowing through human body is very weak (50 KHz, 500μA), which is not stimulant and is very safe to human body. In order to obtain body fat and other data from resistance between both hands and both feet, the five items, i.e. resistance value, height, weight, age and gender are required, which are obtained in accordance with basic human data collected by the company independently.

There is little scope for technician error as such, but factors such as eating, drinking and exercising must be controlled since hydration level is an important source of error in determining the flow of the electric current to estimate body fat. The instructions for use of instruments typically recommends that measurements should not be done soon after drinking or eating or exercising, or when dehydrated. Instruments require details such as sex, age and height to be entered, and use formulae taking these into account; for example, men and women store fat differently around the abdomen and thigh region.

It is important to know our biological age. If we know where the problems exist, we can initiate the lifestyle modifications necessary to improve our health and increase our vitality. Maintaining an ideal weight can help prevent obesity or weight loss and other diseases, and lead a longer life. We should build up non-fat physique by increasing skeletal muscle and improving resting metabolism.

Complementing exercise along with a proper diet is the key to a healthy lifestyle. In today's world, exercising routine is regarded imperfect without vital elements called Bodybuilding supplements. They act as a fuel for our body and boost sporting performance. Herbalife is a world leader in the wellness industry. Their products

do detoxification and cleansing of body systems from the inside, weight management, supplementation, anti-aging, prevent future diseases. Among these are Aloe Plus Tablet, Afresh, Cell -U -Loss Tablet, Personalized Protein Powder, Nutritional Shake Mix, Multivitamin Mineral and Herbal Tablet, Cell Activator Tablet, Activated Fiber Tablet for better weight management.

Interpretation of body composition analysis report of postgraduate students (Female + Male) shows that underweight person is 31.8 %; normal person is 47.7 %; Overweight person is 11.4 % and obese person is 9.1 %.

Interpretation of body composition analysis report of postgraduate students (Female) shows that underweight person is 34.4 %; normal person is 37.5 %; Overweight person is 15.6 % and obese person is 12.5 %.

Interpretation of body composition analysis report of postgraduate students (Male) shows that underweight person is 25 %; normal person is 75 %; Overweight person is 0 % and obese person is 0 %.

KEYWORDS: Height, Weight, Fat %, Subcutaneous Fat %, Visceral Fat %, Skeletal Muscle %, RM, BMI, Body Age

INTRODUCTION

Bioelectrical impedance analysis (BIA) is a commonly used method for estimating body composition, and in particular body fat. Since the advent of the first commercially available devices in the mid-1980s the method has become popular owing to its ease of use, portability of the equipment and it's relatively low cost compared to some of the other methods of body composition analysis. It is familiar in the consumer market as a simple instrument for estimating body fat. BIA actually determines the electrical impedance, or opposition to the flow of an electric current through body tissues which can then be used to calculate an estimate of total body water (TBW). TBW can be used to estimate fat-free body mass and, by difference with body weight, body fat [1].

Many of the early research studies showed that BIA was quite variable and it was not regarded by many as providing an accurate measure of body composition. In recent years technological improvements have made BIA a more reliable and therefore more acceptable way of measuring body composition. Nevertheless it is not a "gold standard" or reference method. Like all assessment tools, the result is only as good as the test done. Although the instruments are straightforward to use, careful attention to the method of use (as described by the manufacturer) should be given.

Simple devices to estimate body fat, often using BIA, are available to consumers as body fat meters. These instruments are generally regarded as being less accurate than those used clinically or in nutritional and medical practice. They tend to under-read body fat percentage [2].

Dehydration is a recognized factor affecting BIA measurements as it causes an increase in the body's electrical resistance, so has been measured to cause a 5 kg underestimation of fat-free mass i.e. an overestimation of body fat [3].

Body fat measurements are lower when measurements are taken shortly after consumption of a meal, causing a variation between highest and lowest readings of body fat percentage taken throughout the day of up to 9.9% [4].

Moderate exercise before BIA measurements lead to an overestimation of fat-free mass and an underestimation of body fat percentage due to reduced impedance [5]. For example moderate intensity exercise for 90–120 minutes before BIA measurements causes nearly a 12 kg overestimation of fat-free mass, i.e. body fat is significantly underestimated [6]. Therefore it's recommended not to perform BIA for several hours after moderate or high intensity exercise [7].

BIA is considered reasonably accurate for measuring groups, or for tracking body composition in an individual over a period of time, but is not considered sufficiently accurate for recording of single measurements of individuals [8].

The accuracy of consumer grade devices for measuring BIA has not been found to be sufficiently accurate for single measurement use and is better suited for use to measure changes in body composition over time for individuals [9].

Bioelectrical impedance analysis (BIA) is widely used in clinics and research to measure body composition. However, the results of BIA validation with reference methods are contradictory, and few data are available on the influence of adiposity on the measurement of body composition by BIA. BIA is a good alternative for estimating % BF when subjects are within a normal body fat range. BIA tends to overestimate %BF in lean subjects and underestimate % BF in obese subjects [10].

Bioelectrical impedance analysis (BIA) is a promising tool in the evaluation of body composition in large population studies because it is fast, is inexpensive, and does not require extensive operator training or cross-validation. The empiric nature of the relation between resistance and reactance measured by BIA and body composition has led to the development of equations that translate the raw data into liters of body water or kilograms of fat-free mass (FFM) or fat mass. These equations may not be easily transferred from one population to another if the populations differ significantly in important determinants of body composition such as age, obesity, and illness. Review of two recent studies from the Framingham Heart Study in which BIA was first compared with dual-energy X-ray absorptiometry (DXA) as a validation technique, and then compared with the body mass index (BMI, in kg/m2) as an alternative estimate of body fat. BIA was a good predictor of DXA-derived FFM ($r = 0.85$-0.88, $P < 0.001$) and was superior to BMI as an estimator of body fat [11].

Over the past decade, considerable attention has been paid to accurately measuring body composition in diverse populations. Recently, the use of air-displacement plethysmography (AP) was proposed as an accurate, comfortable, and accessible method of body-composition analysis. AP is an accurate method for assessing body composition in healthy adults. Future studies should assess further the cause of the individual variations with this new method [12].

Obesity continues increasing at epidemic levels worldwide, as does the number of genetic studies that focus on obesity. Body mass index (BMI) is often used to characterize weight phenotypes and obesity status due to its simplicity. Refined measurements of body composition may be needed to understand variations in gene expression. This study explores gene expression when individuals are characterized as overweight based on BMI versus body fat percent. Individuals were recruited to a natural history protocol at the National Institutes of Health. Twelve Caucasian participants with the highest and lowest BMI were included. Whole-body air displacement plethysmography was performed to calculate body fat percent, and BMI was calculated. Fasting whole blood was collected and RNA extracted. Quantitative real time PCR array was used to determine expression of 96 obesity related genes. The PCR array from participants with high BMI compared to low BMI showed dysregulation of four genes: peroxisome proliferator-activated receptor gamma coactivator 1-alpha (*PPARGC1A*), pro-opiomelanocortin (*POMC*), growth hormone secretagogue receptor (*GHSR*), and leptin (*LEP*), whereas participants with high body fat compared to low body fat showed dysregulation of one gene: *PPARGC1A*. This research showed differential gene expression and clinical indices depending on method of weight Classification [13].

The study aims to improve accuracy of Bioelectrical Impedance Analysis (BIA) prediction equations for estimating fat free mass (FFM) of the elderly by using non-linear Back Propagation Artificial Neural Network (BP-ANN) model and to compare the predictive accuracy with the linear regression model by using energy dual X-ray absorptiometry (DXA) as reference method. When compared the performance of developed prediction equations for estimating reference FFM_{DXA}, the linear model has lower r^2 with a larger SD in predictive results than that of BP-ANN model, which indicated ANN model is more suitable for estimating FFM [14].

Although international interest in classifying subject health status according to adiposity is increasing, no accepted published ranges of percentage body fat currently exist. Empirically identified limits, population percentiles, and scores have all been suggested as means of setting percentage body fat guidelines, although each has major limitations. A convenient sample of 1626 adults with BMIs ≤35 was evaluated. Independent percentage body fat predictor variables in multiple regression models included 1/BMI, sex, age, and ethnic group (*R* values from 0.74 to 0.92 and SEEs from 2.8 to 5.4% fat). The prediction formulas were then used to prepare provisional healthy percentage body fat ranges based on published BMI limits for underweight (<18.5), overweight (≥25), and obesity (≥30). This proposed approach and initial findings provide the groundwork and stimulus for establishing international healthy body fat ranges [15].

Several studies have raised the suspicion that the body mass index (BMI) cut-off for overweight as defined by the WHO may not adequately reflect the actual overweight status. The present study looked at the relationship between BMI and body fat per cent (BF %) / health risks (hypertension and type 2 diabetes) in male residents of Lucknow city, north India to evaluate the validity of BMI cut-off points for overweight. The study subjects showed higher body fat percentage and risk factors like hypertension and type 2 diabetes at normal BMI range proposed by the WHO. The cut-off for BMI was proposed to be 24.5 kg/m^2 for our study population. If overweight is regarded as an excess of body fat and not as an excess of weight (increased BMI), the cut-off points for overweight based on BMI would need to be lowered. However, the confidence of estimate of the BMI cut-off in the present study may be considered with the limitations of BI analysis studies [16].

Body composition assessment in patients with chronic renal failure is of paramount importance since studies have demonstrated the association of protein-energy malnutrition with an increased morbidity and mortality in this population. However, practical and sensible indicators of body compartments are still needed for clinical purposes. Thus, we aimed to evaluate the simple methods of skinfold thicknesses (SKF) and bioelectrical impedance analysis (BIA), using dual-energy X-ray absorptiometry (DEXA) as a reference method, for the assessment of body fat in patients on long-term haemodialysis therapy [17].

Various Measuring techniques are available for determining body fat percentage, such as Underwater (Hydrostatic) weighing, Near-infrared interactance, Dual energy X-ray absorptiometry (DEXA Scan), Body average density measurement, Bioelectrical impedance analysis, Anthropometric methods such as Height and circumference methods and Skinfold methods, Ultrasound, from BMI etc [18].

Analysis of body composition such as body weight, BMI, body fat percentage, segmental subcutaneous fat & skeletal muscle percentage (whole body, trunk, legs and arms), resting metabolism, visceral fat level and body age is done by bioelectrical impedance technique and results are interpreted and corresponding instructions for better health improvement is given. For ideal weight management and for a more accurate and precise body composition analysis full Body Sensing Technology Karada Scan Body Composition Monitor – HBF-375 is used [19, 20 and 21].

Present paper deals with body composition analysis of postgraduate students using bioelectrical impedance analysis method and their counseling on diet and lifestyle. Bioelectrical impedance analysis method involves determination of Body Weight, Body Fat Percentage, Segmental Subcutaneous Fat Percentage (Whole Body, Trunk, Arms and Legs), Visceral Fat percentage, Segmental Skeletal Muscle Percentage (Whole Body, Trunk, Arms and Legs), Resting Metabolism, Body Mass Index and Body Age. Results are interpreted in terms of ideal weight, overweight / underweight, Period required for weight Loss / Gain at the rate of 1.5 kg per month, Period required for weight maintenance, Fat %, Subcutaneous Fat % (Trunk), Visceral Fat %, Skeletal Muscle % (Whole body), RM, BMI and Body Age. It also highlights correct weight reduction and instructions for better health improvement and weight Loss, weight gain and weight maintenance programme.

METHODOLOGY

Body composition analysis of 44 postgraduate students of Brijlal Biyani Science College Amravati Maharashtra India using bioelectrical impedance analysis method is done during 23rd September 2019 to 27th September 2019. For ideal weight management and for a more accurate and precise body composition analysis full Body Sensing Technology Karada Scan Body Composition Monitor – HBF-375 as shown in Figure 1 is used which measures body composition- Body Weight, Body Fat Percentage, Segmental Subcutaneous Fat Percentage (Whole Body, Trunk, Arms and Legs), Visceral Fat percentage, Segmental Skeletal Muscle Percentage (Whole Body, Trunk, Arms and Legs), Resting Metabolism, Body Mass Index and Body Age. The general principle behind bioelectrical impedance analysis is that two or more conductors are attached to a person's body and a small electric current is sent through the body. The resistance between the conductors provides a measure of body fat between a pair of electrodes, since the resistance to electricity varies between adipose, muscular and skeletal tissue. Fat-free mass (muscle) is a good conductor as it contains a large amount of water (approximately 73%) and electrolytes, while fat is anhydrous and a poor conductor of electric current.

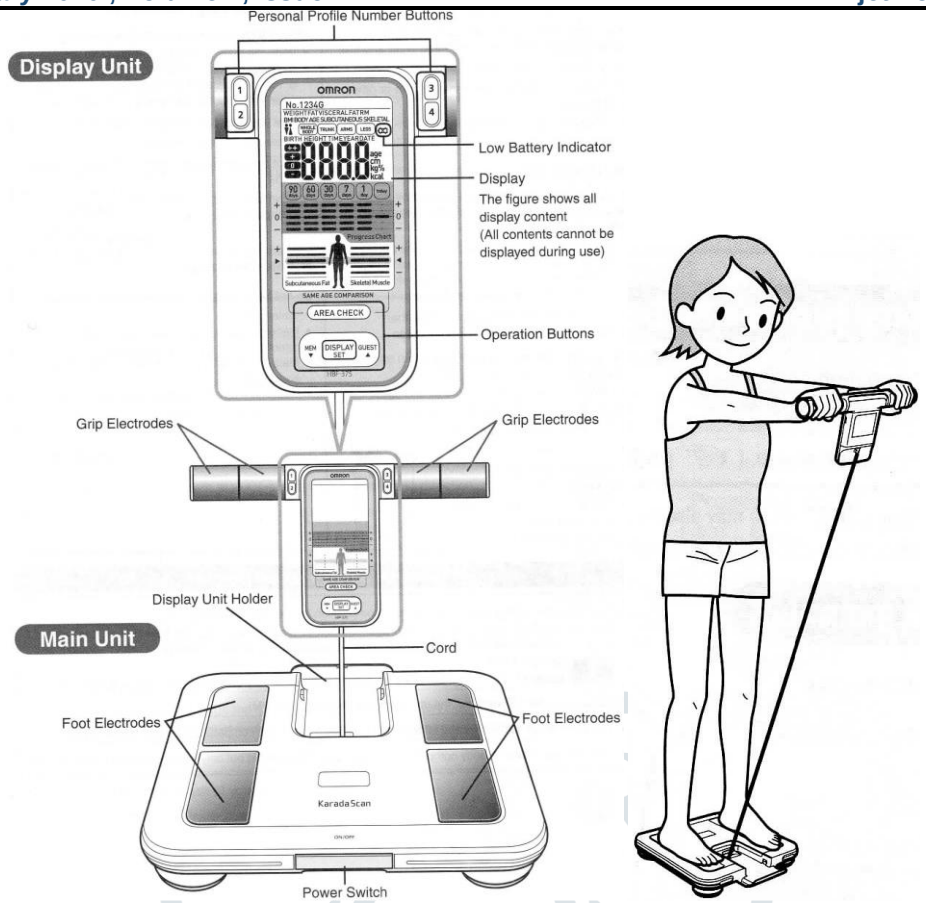

Fig 1. Omron Body Composition Scale Karada Scan HBF-375

Each (bare) foot may be placed on foot electrodes, and grip electrodes may be held in each hand. Karada Scan measures whole body resistance by using electrode of both hands and both feet. Therefore, it is less subject to variation of water content distribution in human body.

In order to obtain resistance value necessary to calculate body fat and to ensure stability of measurement results, one should basically keep their arm and body at 90^0 and straighten their arms when performing measuring.

Karada Scan measures body resistance by using weak current flowing through both hands and both feet (Bioelectrical Impedance / Biological resistance method). Tissues with more water content in human body tend to conduct electricity (such as muscle and vein) easily. Fat tissue almost conducts no electricity. The body feature is used to calculate percentage of fat tissue and non fat tissue. Current flowing through human body is very weak (50 KHz, 500μA), which is not stimulant and is very safe to human body. In order to obtain body fat and other data from resistance between both hands and both feet, the five items, i.e. resistance value, height, weight, age and gender are required, which are obtained in accordance with basic human data collected by the company independently.

There is little scope for technician error as such, but factors such as eating, drinking and exercising must be controlled since hydration level is an important source of error in determining the flow of the electric current to estimate body fat. The instructions for use of instruments typically recommends that measurements should not be done soon after drinking or eating or exercising, or when dehydrated. Instruments require details such as sex, age and height to be entered, and use formulae taking these into account; for example, men and women store fat differently around the abdomen and thigh region.

BMI: Body mass index is defined as the individual's body mass divided by the square of his or her height. The formulae universally used in medicine produce a unit of measure of kg/m^2.

$$\textbf{BMI = Weight (Kg) / [height (m)]}^2$$

The WHO regards a BMI of less than 18.5 as underweight and may indicate malnutrition, an eating disorder, or other health problems, while a BMI greater than 25 is considered overweight and above 30 is considered obese.

Body fat: Body fat includes essential body fat and storage body fat. Essential body fat is necessary to maintain life and reproductive functions. The percentage of essential body fat for women is greater than that for men, due to the demands of childbearing and other hormonal functions. The percentage of essential fat is 3–5 % in men, and 10-16 % in women. Storage body fat consists of fat accumulation in adipose tissue, part of which protects internal organs in the chest and abdomen.

Body fat percentage = [Body fat Mass (Kg) / Body weight (Kg)] × 100

Visceral Fat : In humans, adipose tissue is located beneath the skin (subcutaneous fat), around internal organs (visceral fat), in bone marrow (yellow bone marrow) and in breast tissue.

BMR (RMR) : Basal metabolic rate (BMR), and the closely related resting metabolic rate (RMR), is the amount of energy expended daily by humans and other animals at rest. Rest is defined as existing in a neutrally temperate environment while in the post-absorptive state.
The release, and using, of energy in this state is sufficient only for the functioning of the vital organs, the heart, lungs, nervous system, kidneys, liver, intestine, sex organs, muscles, and skin.

BMR generally decreases with age and with the decrease in lean body mass (as may happen with aging). Increasing muscle mass increases BMR. Aerobic fitness level, a product of cardiovascular exercise, while previously thought to have effect on BMR, has been shown in the 1990s not to correlate with BMR, when fat-free body mass was adjusted for New research has, however, come to light that suggests anaerobic exercise does increase resting energy consumption. Illness, previously consumed food and beverages, environmental temperature, and stress levels can affect one's overall energy expenditure as well as one's BMR.

Skeletal muscle : Skeletal muscle is a form of striated muscle tissue existing throughout the human body, and which is under control of the somatic nervous system; that is to say, it is voluntarily controlled. It is one of three major muscle types, the others being cardiac and smooth muscle. As their name suggests, most skeletal muscles are attached to bones by bundles of collagen fibers known as tendons. If we strengthen skeletal muscle and improve basal metabolism, we will not get fat easily.

Skeletal muscle percentage = [Skeletal muscle Mass (Kg) / Body weight (Kg)] × 100

Body Age: Biological age depends on how time and lifestyle have affected organs and cells compared to other people of chronological age. Factors of biological aging include changes in the physical structure of the body as well as changes in the performance of motor skills and sensory awareness. Chronological age is current age in years, calculated from birth date.

It means we may be 40 years old, but we have the health and body of a 50 year old. Or, on the flip side, we may be 55 years old and have the health and body of a 38 year old. There is a direct link between vitality and behavioral changes. Healthy living equals slow aging, where unhealthy lifestyle choices equal rapid aging.

This is why it is important to know our biological age. If we know where the problems exist, we can initiate the lifestyle modifications necessary to improve our health and increase our vitality.

If we have been taking care of ourselves, the test may show that our biological age is 5 to 10 years younger than our calendar age. However, this parameter may show our real age to be several years older than our actual age, in which case it will give us recommendations on how to improve our health in specific ways, such as with better nutrition, exercise, supplements, more sleep, etc. Health reviser's Biological Age test is a sensitive indicator of health disorders that allows us to make an early decision, so that hopefully health issues never become a problem.

Body age varies according to body composition and resting metabolism, even if our height and weight is the same.

Interpretation of Body composition result is shown in Table 1. Date of Birth of Undergraduate Students is shown in Table 2. Body composition analysis of postgraduate students of Brijlal Biyani Science College Amravati Maharashtra India using bioelectrical impedance analysis method is shown in Table 3.

Table 1. Interpretation of Body composition result

Interpretation of Body Composition Report						
Body Fat %	**Gender**	**Low**	**Normal**	**High**	**Very High**	
	Female	Up to 19.9	20-29.9	30-34.9	35 & more	
	Male	Up to 9.9	10-19.9	20-24.9	25 & more	
Trunk Fat %			**Normal**	**High**	**Very high**	
			<15	16-18	18+	
Visceral Fat %			**0 (Normal)**	**+ (High)**	**++ (Very High)**	
			0.5-9.5	10.0-14.5	15.0-30.0	
Skeletal Muscle %	**Gender**	**Age**	**-(Low)**	**0 (Normal)**	**+ (High)**	**++ (Very High)**
	Female	18-39	< 24.3	24.3-30.3	30.4-35.3	≥ 35.4
		40-59	< 24.1	24.1-30.1	30.2-35.1	≥ 35.2
		60-80	< 23.9	23.9-29.9	30.0-34.9	≥ 35.0
	Male	18-39	< 33.3	33.3-39.3	39.4-44.0	≥ 44.1
		40-59	< 33.1	33.1-39.1	39.2-43.8	≥ 43.9
		60-80	< 32.9	32.9-38.9	39.0-43.6	≥ 43.7
BMI			**Under wt**	**Normal**	**Over wt**	**Obese**
			Up to18.4	18.5-24.9	25-29.9	30 & more

Table 2. Date of Birth of Postgraduate Students

Case No.	Class	Date of Birth	Age	Height cm
1	M. Sc. II	11.07.1994	25	171
2	M. Sc. II	02.11.1995	24	176
3	M. Sc. I	01.07.1996	23	154
4	M. Sc. II	25.07.1996	23	180
5	M. Sc. I	18.08.1996	23	148.5
6	M. Sc. II	04.09.1996	22	155
7	M. Sc. II	16.11.1996	22	158.5
8	M. Sc. I	02.01.1997	22	168.5
9	M. Sc. II	09.01.1997	22	173
10	M. Sc. II	20.01.1997	22	149
11	M. Sc. II	07.03.1997	22	152.5
12	M. Sc. II	22.04.1997	22	157
13	M. Sc. I	11.05.1997	22	159.5
14	M. Sc. I	21.05.1997	22	160
15	M. Sc. I	17.09.1997	22	158
16	M. Sc. II	10.11.1997	22	159
17	M. Sc. II	14.11.1997	22	166.5
18	M. Sc. I	23.11.1997	22	165
19	M. Sc. I	26.11.1997	22	156
20	M. Sc. I	05.12.1997	22	156
21	M. Sc. II	19.12.1997	22	154
22	M. Sc. I	01.01.1998	21	158
23	M. Sc. II	25.02.1998	21	162
24	M. Sc. II	22.03.1998	21	167.5
25	M. Sc. I	27.03.1998	21	156

26	M. Sc. II	08.04.1998	21	158.5
27	M. Sc. I	17.04.1998	21	173
28	M. Sc. I	16.05.1998	21	154
29	M. Sc. I	23.05.1998	21	163
30	M. Sc. I	17.06.1998	21	153
31	M. Sc. II	29.06.1998	21	168
32	M. Sc. I	02.07.1998	21	154
33	M. Sc. II	04.07.1998	21	160
34	M. Sc. II	06.07.1998	21	159
35	M. Sc. I	15.07.1998	21	168
36	M. Sc. II	18.08.1998	21	150.5
37	M. Sc. I	28.09.1998	21	151
38	M. Sc. I	05.11.1998	21	164
39	M. Sc. I	26.11.1998	21	159
40	M. Sc. I	28.12.1998	21	153.5
41	M. Sc. I	01.02.1999	20	170
42	M. Sc. I	19.04.1999	20	163
43	M. Sc. I	06.07.1999	20	166
44	M. Sc. I	07.07.1999	20	154

Table 3. Body composition analysis of postgraduate students using bioelectrical impedance analysis method

Case No	Male / Female	Age	Height cm	Weight Kg	Fat %	Subcutaneous Fat %				Visceral Fat %	Skeletal Muscle %				RM Kcal	BMI	Body Age
						Whole Body	Trunk	Arms	Legs		Whole body	Trunk	Arms	Legs			
1	M	25	171	69.5	24.0	16.5	14.7	24.4	24.2	7.5	32.5	25.3	38.3	49.8	1595	23.8	35
2	M	24	176	75.2	27.2	18.6	16.6	27.8	27.8	8.0	31.8	23.9	37.9	49.1	1674	24.3	38
3	F	23	154	47.2	26.7	22.1	18.3	38.7	34.0	2.0	26.6	22.2	31.2	37.9	1084	19.9	23
4	M	23	180	53.9	10.8	7.2	5.6	13.3	11.9	0.5	39.0	34.0	43.8	56.0	1399	16.6	18
5	F	23	148.5	42.4	33.2	24.9	22.5	46.1	38.2	2.0	24.1	20.2	29.4	34.1	989	19.2	23
6	F	22	155	72.9	37.5	35.1	30.7	52.0	50.4	10.5	22.9	17.1	21.4	36.3	1432	30.3	45
7	F	22	158.5	43.5	20.6	17.2	12.9	31.9	28.1	1.0	29.1	24.9	35.0	39.8	1046	17.3	18
8	M	22	168.5	59.1	8.6	6.5	5.5	11.0	9.4	4.0	38.6	34.3	42.5	55.7	1492	20.8	18
9	M	22	173	58.3	19.3	13.0	11.1	20.4	19.7	3.5	35.3	28.7	41.0	52.4	1437	19.5	20
10	F	22	149	55.8	34.3	29.7	26.1	48.2	44.3	5.5	23.5	18.7	25.7	36.0	1187	25.1	35
11	F	22	152.5	45.3	27.5	22.2	18.7	39.7	34.4	2.0	26.2	22.0	31.1	37.0	1051	19.5	21
12	F	22	157	64.2	37.1	31.7	28.4	52.1	48.3	6.5	23.1	18.0	23.4	35.2	1305	26.0	40
13	F	22	159.5	40.3	20.5	16.1	12.2	31.9	27.2	0.5	29.1	25.3	35.7	38.3	995	15.8	18
14	F	22	160	50.2	32.0	24.5	21.8	45.3	38.6	2.0	25.4	21.2	29.2	35.4	1116	19.6	25
15	F	22	158	45.4	23.2	19.1	15.1	34.8	30.5	1.5	28.2	23.9	33.4	38.6	1068	18.2	18
16	F	22	159	81.7	39.2	37.3	32.8	54.2	53.5	12.5	22.5	16.3	19.0	36.1	1555	32.3	49
17	M	22	166.5	50.0	13.3	09.0	07.3	15.3	14.1	2.0	36.8	31.6	42.5	53.9	1317	18.0	18
18	F	22	165	54.4	30.0	23.8	20.6	43.1	37.5	2.0	26.3	21.7	29.3	37.0	1189	20.0	25
19	F	22	156	47.2	27.4	22.1	18.6	39.7	34.4	2.0	26.5	22.2	31.1	37.8	1083	19.4	22
20	F	22	156	73.8	38.6	35.6	31.5	53.9	52.3	10.0	22.4	16.7	20.6	36.0	1439	30.3	46
21	F	22	154	62.2	36.7	31.7	28.2	51.5	47.9	6.5	23.0	17.9	23.7	35.1	1275	26.2	39
22	F	21	158	55.3	30.8	25.8	22.2	43.8	39.3	3.0	25.5	20.8	28.2	37.8	1197	22.2	29
23	F	21	162	46.9	20.2	17.4	12.9	31.5	28.3	1.0	29.7	25.2	34.9	40.8	1104	17.9	18

24	M	21	167.5	69.9	23.1	16.2	14.5	23.8	23.5	8.5	32.7	25.7	38.3	50.0	1605	24.9	34
25	F	21	156	48.9	30.5	24.1	21.0	43.4	37.6	2.0	25.5	21.2	29.6	36.7	1099	20.1	24
26	F	21	158.5	45.9	30.5	22.8	20.2	43.3	36.2	1.5	26.0	22.0	30.8	35.5	1055	18.3	19
27	M	21	173	65.0	16.4	11.5	10.0	17.6	16.7	5.0	36.0	30.1	40.7	53.1	1560	21.7	24
28	F	21	154	47.2	37.4	27.5	25.7	51.7	43.1	2.5	23.6	19.7	27.8	33.7	1052	19.9	26
29	F	21	163	47.2	22.0	18.2	14.1	33.7	29.6	1.0	29.1	24.7	34.1	39.4	1103	17.8	18
30	F	21	153	40.6	18.9	16.4	11.8	30.1	27.0	1.0	29.1	25.1	35.6	39.9	1002	17.3	18
31	M	21	168	57.5	16.7	11.5	09.8	18.2	17.3	4.0	35.5	29.6	40.7	52.6	1431	20.4	20
32	F	21	154	50.6	24.0	21.8	17.1	35.3	32.4	2.5	28.0	23.1	32.1	40.8	1149	21.3	23
33	M	21	160	50.9	11.5	08.2	06.8	14.1	12.7	3.5	36.4	31.8	41.5	53.5	1334	19.9	18
34	F	21	159	44.5	24.8	19.5	15.9	36.7	31.4	1.0	27.7	23.6	33.1	37.5	1050	17.6	18
35	F	21	168	45.1	19.3	15.6	11.4	30.8	26.9	0.5	30.4	26.2	36.1	40.2	1079	16.0	18
36	F	21	150.5	59.9	37.9	32.5	29.1	53.3	49.6	7.0	22.3	17.5	23.5	34.7	1234	26.4	39
37	F	21	151	38.9	23.7	18.6	14.9	35.3	29.9	1.0	27.3	23.5	33.8	37.6	961	17.1	18
38	F	21	164	49.4	26.2	20.8	17.3	38.5	33.2	1.5	27.6	23.3	32.0	38.2	1124	18.4	18
39	F	21	159	47.5	23.3	19.6	15.4	34.9	31.0	1.5	28.3	23.9	33.2	39.4	1102	18.8	18
40	F	21	153.5	48.3	26.4	22.4	18.4	38.4	34.3	2.5	26.7	22.2	31.1	38.7	1103	20.5	23
41	M	20	170	45.7	20.2	12.9	10.6	19.9	19.5	0.5	36.8	29.6	43.4	53.9	1232	15.8	18
42	F	20	163	81.7	39.7	36.5	32.4	55.7	54.5	10.5	22.4	16.4	18.8	35.8	1553	30.7	47
43	M	20	166	57.8	23.9	16.0	14.0	24.6	24.3	4.5	33.2	25.8	40.0	50.5	1408	21.0	24
44	F	20	154	60.6	32.0	28.9	24.7	45.0	42.0	6.0	24.9	19.7	26.4	37.7	1273	25.6	34

RESULTS AND DISCUSSION

Ideal weight : The ideal BMI is 22. Maintaining an ideal weight can help prevent obesity or weight loss and other diseases, and lead a longer life. The ideal weight for BMI of 22 is calculated as follows.

$$\textbf{Ideal Weight (Kg)} = 22 \times [\text{height (m)}]^2$$

However this method of ideal weight calculation may not be applicable for professional athletes and body builders, who have higher muscles ratio in their bodies.

Correct Weight Reduction: If we lose weight by going on a diet instead of doing exercise and neglecting nutrition balance, even if our weight is reduced, resting metabolism will decrease as muscle (Skeletal muscle) decreases and we are more likely to become fatter. We should build up non-fat physique by increasing skeletal muscle and improving resting metabolism.

Interpretation of body composition analysis report of undergraduate students is shown in table 4.

Table 4. Interpretation of body composition analysis report of postgraduate students

Case No	Ideal wt (Kg) = 22 × [ht (m)]²	Over wt / Under wt Kg	Period required for wt Loss / Gain at the rate of 1.5 kg per month	Period required for wt Maintenance	Fat %	Subcutaneous Fat % (Trunk)	Visceral Fat %	Skeletal Muscle % (Whole body)	RM Kcal	BMI	Body Age
1	64.3	↓ 5.2 Kg Over wt	3.5 Month	3.5 Month	↓ High	Normal	Normal	↑ Low	↑	Normal	↓
2	68.1	↓ 7.1 Kg Over wt	5.0 Month	5.0 Month	↓ Very high	↓ High	Normal	↑ Low	↑	Normal	↓
3	52.2	↑5.0 Kg Under wt	3.5 Month	3.5 Month	Normal	↓ Very High	Normal	Normal	↑	Normal	Normal
4	71.3	↑17.4 Kg Under wt	12.0 Month	12.0 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑

5	48.5	↑ 6.1 Kg Under wt	4.0 Month	4.0 Month	↓ High	↓ Very high	Normal	↑ Low	↑	Normal	Normal
6	52.9	↓20.0 Kg Over wt	13.0 Month	13.0 Month	↓ Very high	↓ Very high	↓ High	↑ Low	↑	↓ Obese	↓
7	55.3	↑11.8 Kg Under wt	8.0 Month	8.0 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
8	62.5	↑3.4 Kg Under wt	2.0 Month	2.0 Month	↑ Low	Normal	Normal	Normal	↑	Normal	↑
9	65.8	↑ 7.5 Kg Under wt	5.0 Month	5.0 Month	Normal	Normal	Normal	Normal	↑	Normal	↑
10	48.8	↓ 7.0 Kg Over wt	5.0 Month	5.0 Month	↓ High	↓ Very high	Normal	↑ Low	↑	↓ Over wt	↓
11	51.2	↑ 5.9 Kg Under wt	4.0 Month	4.0 Month	Normal	↓ Very high	Normal	Normal	↑	Normal	↑
12	54.2	↓10.0 Kg Over wt	7.0 Month	7.0 Month	↓ Very high	↓ Very high	Normal	↑ Low	↑	↓ Over wt	↓
13	56.0	↑15.7 Kg Under wt	10.5 Month	10.5 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
14	56.3	↑6.1 Kg Under wt	4.0 Month	4.0 Month	↓ High	↓ Very High	Normal	Normal	↑	Normal	↓
15	54.9	↑9.5 Kg Under wt	6.5 Month	6.5 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
16	55.6	↓26.1 Kg Over wt	17.5 Month	17.5 Month	↓ Very high	↓ Very high	↓ High	↑ Low	↑	↓ Obese	↓
17	61.0	↑11.0 Kg Under wt	7.5 Month	7.5 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
18	59.9	↑ 5.4 Kg Under wt	4.0 Month	4.0 Month	↓ High	↓ Very high	Normal	Normal	↑	Normal	↓
19	53.5	↑6.3 Kg Under wt	4.0 Month	4.0 Month	Normal	↓ Very High	Normal	Normal	↑	Normal	Normal
20	53.5	↓20.3 Kg Over wt	13.5 Month	13.5 Month	↓ Very high	↓ Very high	↓ High	↑ Low	↑	↓ Obese	↓
21	52.2	↓10.0 Kg Over wt	7.0 Month	7.0 Month	↓ Very high	↓ Very high	Normal	↑ Low	↑	↓ Over wt	↓
22	54.9	↑0.4 Kg Over wt	0.5 Month	0.5 Month	↓ High	↓ Very High	Normal	Normal	↑	Normal	↓
23	57.7	↑10.8 Kg Under wt	7.0 Month	7.0 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
24	61.7	↓8.2 Kg Over wt	5.5 Month	5.5 Month	↓ High	Normal	Normal	↑ Low	↑	Normal	↓
25	53.5	↑4.6 Kg Under wt	3.0 Month	3,0 Month	↓ High	↓ Very High	Normal	Normal	↑	Normal	↓
26	55.3	↑9.4 Kg Under wt	6.0 Month	6.0 Month	↓ High	↓ Very high	Normal	Normal	↑	↑ Under wt	↑
27	65.8	↑0.8 Kg Under wt	0.5 Month	0.5 Month	Normal	↓ High	Normal	Normal	↑	Normal	↓
28	52.2	↑5.0 Kg Under wt	3.5 Month	3.5 Month	↓ Very High	↓ Very High	Normal	↑ Low	↑	Normal	↓
29	58.5	↑11.3 Kg Under wt	7.5 Month	7.5 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
30	51.5	↑10.9 Kg Under wt	7.5 Month	7.5 Month	↑ Low	Normal	Normal	Normal	↑	↑ Under wt	↑
31	62.1	↑ 4.6 Kg Under wt	3.0 Month	3.0 Month	Normal	Normal	Normal	Normal	↑	Normal	↑
32	52.2	↑1.6 Kg Under wt	1.0 Month	1.0 Month	Normal	↓ Very High	Normal	Normal	↑	Normal	↓
33	56.3	↑ 5.4 Kg Under wt	4.0 Month	4.0 Month	Normal	Normal	Normal	Normal	↑	Normal	↑
34	55.6	↑11.1 Kg Under wt	7.5 Month	7.5 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
35	62.1	↑17.0 Kg Under wt	11.5 Month	11.5 Month	↑ Low	Normal	Normal	↓ High	↑	↑ Under wt	↑
36	49.8	↓10.1 Kg Over wt	7.0 Month	7.0 Month	↓ Very high	↓ Very high	Normal	↑ Low	↑	↓ Over wt	↓
37	50.2	↑11.3 Kg Under wt	7.5 Month	7.5 Month	Normal	Normal	Normal	Normal	↑	↑ Under wt	↑
38	59.2	↑ 9.8 Kg Under wt	6.5 Month	6.5 Month	Normal	↓ High	Normal	Normal	↑	↑ Under wt	↑
39	55.6	↑ 8.1 Kg Under wt	5.5 Month	5.5 Month	Normal	Normal	Normal	Normal	↑	Normal	↑
40	51.8	↑ 3.5 Kg Under wt	2.5 Month	2.5 Month	Normal	↓ Very high	Normal	Normal	↑	Normal	↓
41	63.6	↑17.9 Kg Under wt	12.0 Month	12.0 Month	↓ High	Normal	Normal	Normal	↑	↑ Under wt	↑
42	58.5	↑23.2 Kg Over wt	15.5 Month	15.5 Month	↓ Very High	↓ Very High	↓ High	↑ Low	↑	↓ Obese	↓
43	60.6	↑2.8 Kg Under wt	2.0 Month	2.0 Month	↓ High	Normal	Normal	↑ Low	↑	Normal	↓
44	52.2	↓ 8.4 Kg Over wt	6.0 Month	6.0 Month	↓ High	↓ Very high	Normal	Normal	↑	↓ Over wt	↓

In table 4 sign ↑ indicates corresponding value should increase and sign ↓ indicates corresponding value should decrease during weight loss or weight gain programme.

In case number 1 – Fat % has to be decreased and whole body skeletal muscle % and RM has to be increased so that body age can be decreased. And has to undergo 3.5 month weight loss programme (at the rate of 1.5 kg per month) to decrease 5.2 Kg weight. And has to undergo 3.5 month weight maintain programme.

In case number 2 – Fat %, subcutaneous trunk fat % has to be decreased and whole body skeletal muscle % and RM has to be increased so that body age can be decreased. And has to undergo 5 month weight loss programme to decrease 7.1 Kg weight. And has to undergo 5 month weight maintain programme.

In case number 3 – Subcutaneous trunk Fat % has to be decreased and RM has to be increased. And has to undergo 3.5 month weight gain programme to increase 5.0 Kg weight. And has to undergo 3.5 month weight maintain programme.

In case number 4 - RM and BMI has to be increased so that body age can be increased and has to undergo 12 month weight gain programme to increase 17.4 kg weight. And has to undergo 12 month weight maintain programme.

In case number 5 - Fat %, Subcutaneous trunk Fat % has to be decreased and Whole body skeletal muscle % and RM has to be increased. And has to undergo 4 month weight gain programme to increase 6.1 Kg weight. And has to undergo 4 month weight maintain programme.

Likewise interpretation of body composition analysis report of other cases (postgraduate students) can be done.

Correct Weight Reduction in Case No. 16 is shown in Table 5 and Figure 2.

Table 5. Correct Weight Reduction in Case No. 16

Month	Weight Kg	Fat %	Subcutaneous Fat % (Trunk)	Visceral Fat %	Skeletal Muscle % (Whole body)	BMI	Body Age
Rate	**1.5 Kg per Month ↓**	**1.1 % per Month ↓**	**1.1 % per Month ↓**	**0.2 % per Month ↓**	**0.4 % per Month ↑**	**0.5 per Month ↓**	**1.6 Year per Month ↓**
0	81.7	39.2	32.8	12.5	22.5	32.3	49
1	80.2	38.1	31.7	12.3	22.9	31.8	47.4
2	78.7	37.0	30.6	12.1	23.3	31.3	45.8
3	77.2	35.9	29.5	11.9	23.7	30.8	44.2
4	75.7	34.8	28.4	11.7	24.1	30.3	42.6
5	74.2	33.7	27.3	11.5	24.5	29.8	41
6	72.7	32.6	26.2	11.3	24.9	29.3	39.4
7	71.2	31.5	25.1	11.1	25.3	28.8	37.8
8	69.7	30.4	24.0	10.9	25.7	28.3	36.2
9	68.2	29.3	22.9	10.7	26.1	27.8	34.6
10	66.7	28.2	21.8	10.5	26.5	27.3	33
11	65.2	27.1	20.7	10.3	26.9	26.8	31.4
12	63.7	26.0	19.6	10.1	27.3	26.3	29.8
13	62.2	24.9	18.5	9.9	27.7	25.8	28.2
14	60.7	23.8	17.4	9.7	28.1	25.3	26.6
15	59.2	22.7	16.3	9.5	28.5	24.8	25
16	57.7	21.6	15.2	9.3	28.9	24.3	23.4
17	56.2	20.5	14.1	9.1	29.3	23.8	21.8
17.5	55.5	20.0	13.0	9.0	29.5	23.6	21
Normal Value	**55.6**	**20-29.9**	**<15**	**0.5-9.5**	**24.3-30.3**	**18.5-24.9**	**22**

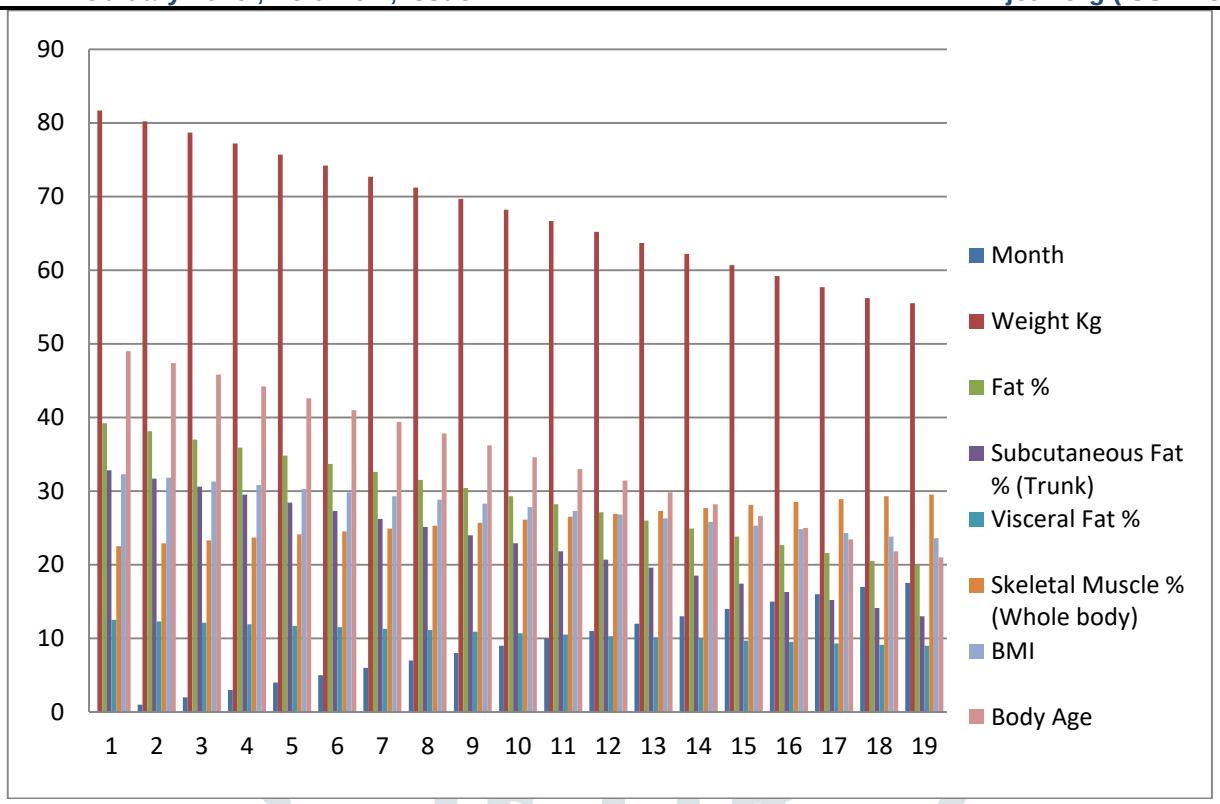

Figure 2 Correct Weight Reduction in Case No. 16

Weight Loss, weight gain and weight maintenance programme: Research shows that complementing exercise along with a proper diet is the key to a healthy lifestyle. This further keeps an individual away from many chronic diseases like diabetes, hypertension, coronary heart disease, obesity, osteoporosis, ill mental health, cancers, stroke and back injury. In today's world, exercising routine is regarded imperfect without vital elements called Bodybuilding supplements. They act as a fuel for our body and boost sporting performance. Bodybuilding supplements are dietary supplements to enhance weight gain, promote weight loss, replace meals and improve performance. They are specially prepared to complement the diet and provide essential nutrients like vitamins, minerals, fatty acids, amino acids, etc. that may be missing or found in insufficient quantities in one's diet.

Herbalife is a world leader in the wellness industry, in business for more than 29 years. They are the pioneer in meal replacement and weight management programme. The company has a range of inner nutritional products suitable for all age groups. They have 3 entries in the Guinness book of world records - They created the maximum number of millionaires in the world; Their Company has trained 10,242 people across the world on a single conference call and; One overweight person Mr. Jim Poore lost 182.5 Kg by using Herbalife products in 19 months. Their products do - detoxification and cleansing of body systems from the inside; weight management; supplementation; anti-aging; and prevent future diseases. Among these are Aloe Plus Tablet, Afresh, Cell -U -Loss Tablet, Personalized Protein Powder, Nutritional Shake Mix, Multivitamin Mineral and Herbal Tablet, Cell Activator Tablet, Activated Fiber Tablet for better weight management.

Aloe Plus Tablet Soothes, cleanses and supports digestive system; Helps to gently dispose of toxins accumulated in the body; Better absorption of nutrients; Aloe vera and other herbs enhances digestion and boosts immunity.

Afresh An invigorating and refreshing energy drink powered by 'Guarana', a Brazilian plant from the Amazon. Its seed contains a substance similar to caffeine known as Guaraine that provide an energetic boost; Available in 4 flavors of Lemon, Peach, Elaichi and Ginger; Can take this drink mix hot or cold; Rich in antioxidants; It can be prepared by taking 1 gm (1 spoon) of Afresh powder in 200 ml (One glass) Hot or Cold water.

Cell -U -Loss Tablet Reduces the appearance of unsightly dimpled; Helps eliminate excess body fluid; Herbal blend of plant - based nutrients.

Personalized Protein Powder Helps to build and maintain lean muscle mass. Protein supplement to satisfy our hunger; Soy and whey protein and essential amino acids.

Nutritional Shake Mix A Nutritious meal with vitamins, minerals and essential nutrients; Protein and healthy fiber help support weight management; Available in 3 delicious flavors of Mango, Chocolate and Vanilla.

Milk Shake It can be prepared by taking 1 spoon of Personalized Protein powder and 2 spoon Nutritional Shake Mix in 250 ml chilled non fat milk. Shake till uniform mixture.

Multivitamin Mineral and Herbal Tablet Essential vitamins, minerals and antioxidants; Supports our immune system; Compliments the nutrition available in Nutritional Shake Mix.

Cell Activator Tablet Powerful antioxidants; Improves nutrient absorption; Enhances vitality and energy.

Activated Fiber Tablet Cleanses and supports the digestive system and reduces fat absorption which leads to better weight management; Adequate dietary fiber is essential for good health. Includes citrus and oat to increase our fiber intake.

Table 6 shows weight loss, weight gain and weight maintenance programme.

Table 6. Weight loss programme, weight gain programme and weight maintenance programme

Programme	Time	Activity / Product	Time / Amount
Weight Loss Programme	Early Morning	Morning Walk	1 Hour
		Aloe Plus Tablet	1 tablet
		Afresh	200 ml (One glass)
		Cell -U -Loss Tablet	1 tablet
		Exercise and Yoga	1 Hour
	Morning	Personalized Protein Powder	250 ml milk shake
		Nutritional Shake Mix	
	Afternoon	Multivitamin Mineral and Herbal Tablet	1 tablet
		Cell Activator Tablet	1 tablet
		Healthy Lunch	
	Evening	Bicycle ride (Cycling)	1 Hour
		Activated Fiber Tablet	1 tablet
		Personalized Protein Powder	250 ml milk shake
		Nutritional Shake Mix	
Weight Gain Programme	Early Morning	Morning Walk	1 Hour
		Aloe Plus Tablet	1 tablet
		Afresh	200 ml (One glass)
		Exercise and Yoga	1 Hour
	Morning	Personalized Protein Powder	250 ml milk shake
		Nutritional Shake Mix	
	Afternoon	Healthy Lunch	
		Multivitamin Mineral and Herbal Tablet	1 tablet
		Cell Activator Tablet	1 tablet
	Evening	Bicycle ride (Cycling)	1 Hour
		Healthy dinner	
		Activated Fiber Tablet	1 tablet
	Night	Personalized Protein Powder	250 ml milk shake
		Nutritional Shake Mix	
Weight Maintenance	Early Morning	Morning Walk	1 Hour
		Aloe Plus Tablet	1 tablet

Programme		Afresh	200 ml (One glass)
		Exercise and Yoga	1 Hour
	Morning	Personalized Protein Powder	250 ml milk shake
		Nutritional Shake Mix	
	Afternoon	Healthy Lunch	
		Multivitamin Mineral and Herbal Tablet	1 tablet
		Cell Activator Tablet	1 tablet
	Evening	Bicycle ride (Cycling)	1 Hour
		Healthy dinner	
		Activated Fiber Tablet	1 tablet

CONCLUSION

For ideal weight management and for a more accurate and precise body composition analysis full Body Sensing Technology Karada Scan Body Composition Monitor – HBF-375 can be used. Karada Scan measures body resistance by using weak current flowing through both hands and both feet (Bioelectrical Impedance / Biological resistance method). Tissues with more water content in human body tend to conduct electricity (such as muscle and vein) easily. Fat tissue almost conducts no electricity. The body feature is used to calculate percentage of fat tissue and non fat tissue. Current flowing through human body is very weak (50 KHz, 500μA), which is not stimulant and is very safe to human body.

There is little scope for technician error as such, but factors such as eating, drinking and exercising must be controlled since hydration level is an important source of error in determining the flow of the electric current to estimate body fat. The instructions for use of instruments typically recommends that measurements should not be done soon after drinking or eating or exercising, or when dehydrated. Instruments require details such as sex, age and height to be entered, and use formulae taking these into account; for example, men and women store fat differently around the abdomen and thigh region.

It is important to know our biological age. If we know where the problems exist, we can initiate the lifestyle modifications necessary to improve our health and increase our vitality. Maintaining an ideal weight can help prevent obesity or weight loss and other diseases, and lead a longer life. We should build up non-fat physique by increasing skeletal muscle and improving resting metabolism.

Complementing exercise along with a proper diet is the key to a healthy lifestyle. In today's world, exercising routine is regarded imperfect without vital elements called Bodybuilding supplements. They act as a fuel for our body and boost sporting performance. Herbalife is a world leader in the wellness industry. Their products do detoxification and cleansing of body systems from the inside, weight management, supplementation, anti-aging, prevent future diseases. Among these are Aloe Plus Tablet, Afresh, Cell -U -Loss Tablet, Personalized Protein Powder, Nutritional Shake Mix, Multivitamin Mineral and Herbal Tablet, Cell Activator Tablet, Activated Fiber Tablet for better weight management.

Interpretation of body composition analysis report of postgraduate students (Female + Male) shows that underweight person is 31.8 %; normal person is 47.7 %; Overweight person is 11.4 % and obese person is 9.1 %.

Interpretation of body composition analysis report of postgraduate students (Female) shows that underweight person is 34.4 %; normal person is 37.5 %; Overweight person is 15.6 % and obese person is 12.5 %.

Interpretation of body composition analysis report of postgraduate students (Male) shows that underweight person is 25 %; normal person is 75 %; Overweight person is 0 % and obese person is 0 %.

Female + Male			Female			Male		
BMI	**No. out of Total 44**	**No. out of 100 %**	**BMI**	**No. out of Total 32**	**No. out of 100 %**	**BMI**	**No. out of Total 12**	**No. out of 100 %**
Under weight	14	31.8	**Under weight**	11	34.4	**Under weight**	03	25
Normal	21	47.7	**Normal**	12	37.5	**Normal**	09	75
Over weight	05	11.4	**Over weight**	05	15.6	**Over weight**	00	00
Obese	04	9.1	**Obese**	04	12.5	**Obese**	00	00
Total	44	100	**Total**	32	100	**Total**	12	100

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