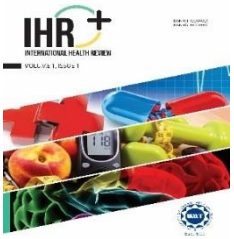

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Article: **Comparison of the Effectiveness of Home- Based Workouts and Gym Training according to Caloric Intake**

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Comparison of the Effectiveness of Home-Based Workouts and Gym Training according to Caloric Intake

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Abstract

With the advancement in technology and the growing sedentary lifestyle, comorbidities related to obesity and overweight are also increasing. Every other person complains of weight gain and is looking for ways to reduce pounds on the scale. Most people have started working out at their homes instead of going out to the gym due to the Coronavirus Pandemic, while others have a proper routine of working out in the gym. Thus, our research study compares the effectiveness of home-based workout programs and gym workouts to analyze which type of workout will provide the most effective results in the shortest time, keeping in view the participants' caloric intake. This study aims to inspect the amount of fat loss, changes are seen on the weight scale, changes in body composition (via BIA analysis), waist circumference, waist-to-hip ratio, keeping in view the intensity and duration of exercise parallel to their caloric intake. It was a four week (one month) comparative study on 50 home-based exercisers and 50 adults working out in the gym (ages 19 – 39) under the supervision of a trainer. The weight, body and visceral fat percentages were assessed using a Body Impedance Analysis (BIA) machine. Also, variables measured were waist circumference, height, blood pressure, pulse rate, respiratory rate and social status (through MacArthur's subjective social status ladder). There was observed dietary history from every individual through a 24-hour dietary recall for the past three days. Subjects had a follow-up after every seven days (weekly), and all the data was entered and analyzed on SPSS. Out of 100 participants, 68% study participants were males and 32% participants were females. Most of the participants were not taking any diet or were taking greater than equal to 1400 kcals per day. Comorbidity data showed that, 86% participants did not have any comorbidities while

remaining 14% had different types of comorbidities. 49% participants were doing strength training, 34% were performing cardio, 12% were doing aerobics and 5% opted for yoga. In the gym in higher social status, it is only males that are working out while some females of low socio-economic status also work out at the gym. Males of very low socioeconomic status also prefer gym workout. In home-based work out there is equal number of males and females in higher social status whereas only females of low socioeconomic status prefer working out at home. Gender wise distribution of type of exercise (TOE) and type of diet (TOD) data showed that most males are strength training with ≥ 1400 kcal. Most females perform cardio exercises with a caloric intake of 1100 to 1300 kcal per day. classification of subjects according to body mass index (BMI) showed that 4% individuals had lower BMI, 24% were normal, 14% and 22% were overweight and obese respectively, however 28% had morbid obesity. Results showed that people who do home based workout had significant difference with body fat percentage, visceral fat percentage, waist circumference and body mass index. However, there were no significant differences found in terms of Waist to hip ratio, heart rate, and Respiratory Rate. The chi-square test shows .001 significance which means there is a significant association between BMI and gender. Gym and home-based workouts have their benefits, and we cannot label one as more beneficial. But people who work out in the gym had lesser body fat and lesser visceral fat, which gives it more significance. Moreover, gym workouts proved to keep control of blood pressure in individuals. Both gym and home workouts have similar effects on the waist to hip ratio, heart rate and respiratory rate. The benefit of home workouts is evident in reducing waist circumference.

Keywords: Overweight, workout, body composition, weight loss, sedentary lifestyle, caloric intake

Introduction

A marked shift is seen in daily activities and eating patterns around the globe with the changing time trends. People give preference to an easy and sedentary lifestyle over a physically active one. The most vulnerable age groups are teenagers who sit on technological devices all day long and

donnot know the importance of physical activity in their lives. The World Health Organization (WHO), in their study in 2014 worldwide, estimated 1.9 billion teenagers and adults suffering from overweight and over 600 million falling under the category of obesity [1].

Obesity is considered a serious health risk due to its association with comorbid diseases like hypertension, diabetes mellitus, atherosclerosis, coronary heart disease, liver disease, and cancer. The rise in obesity and overweight is caused due to unhealthy eating habits seen among the communities. Consumption of high-fat meals, increased sodium intake through processed foods, sugary drinks combined with an inactive lifestyle leads to an increase in weight and fat. Research shows that sitting in front of the television for more than two hours a day puts television watchers at risk of being overweight and obese [2]. The only way to accommodate or utilize extra calories is through burning them.

Losing weight does not only depend on diet only but involves increasing your movement throughout the day. This can be simply done by improving your step count each day. That can be done by adding 30 minutes of walk each day (7 days/week). A study by Eckel in 1998 has shown beneficial effects from exercising, significantly majorly changing fat and lean body mass [3]. Diabetic management programs have also declared exercise and physical activity a crucial component to control type 2 diabetes and minimizing its vascular complications [4]. Many dietitians have endorsed that 10% weight loss is required to provide maximum health benefits and minimize health risks to an individual. Other health researchers also suggest that 3% to 5% weight loss can also be benefit [5].

The most appropriate method of assessing an individual's health is viewing the composition of the human body. The lower the body fat levels, the lower the risk of health diseases to an individual like cardiovascular issues, diabetes, hypertension and other various bone-related diseases like osteoarthritis, knee pain etc. There are numerous methods for evaluating body composition like DXA (Dual X-ray Absorptiometry) scan, skinfold measurement calipers, water weighing and many more. DXA scans are pretty costly and not portable, while skin-fold calipers and BIA-machines are portable, user-friendly and less costly.

Bioelectrical Impedance Analysis (BIA) can estimate body composition (e.g., quantities of fat mass and fat-free mass) by running a small electrical current through the body. There is a possibility because different bodily tissues (e.g., muscle, fat, bone, etc.) all have varying amounts of water content. As a result, they all differ in terms of electrical conductivity [6].

Different studies have worked on finding the effectiveness of different types of workouts. The major kinds of exercises are cardio, strength, flexibility, balance and coordination exercises. The most common exercise types include brisk walking, squats, pushups, lunges, deadlifts, planks, crunches etc. There are no magic exercises that get the person a desired result overnight but require effort and hard work to achieve goals. But the truth is some workouts or exercises show quicker results than others and are called to be more effective. People who lose weight have been seen to self-monitor themselves by monitoring their eating habits with regular weight checks, calorie counting, meal preparations etc., along with more than 30 minutes of daily physical activity [7]. Home training is beneficial as they are inexpensive, save time by eliminating travelling time to the gym, and a person can perform workouts whenever the person feels like doing so. There is an extensive range of home training equipment. Still, a person can start their journey with basic and simple equipment or perform home training without equipment simply by performing Cardio, Pilates, and Yoga. Home workouts play an extensive role in physical fitness. Still, utmost dedication is required, which can only be achieved through positive encouragement otherwise individuals' doing home training simply drop out [8].

Diet and working out individually cannot create a difference until both are combined to obtain desired results. From all the currently available methods for weight loss in moderately overweight and obese individuals, diet and exercise are the safest and more reliable methods for long term results. Unfortunately, there are no permanent weight loss methods, and individuals have to maintain a healthy diet and a physical activity to ensure weight loss or maintenance. Combining diet and exercise resulted in 20% increased weight loss in moderately obese individuals [9].

The most appropriate way is to consume a diet of approximately 1200 kcals to 2000 kcals per week besides physical activity of 30 minutes 7 days a week

or 150 to 250 minutes per week. To induce weight loss, it is recommended to participate in increased physical activity, more daily activity and stick to an up to 2000 calorie diet [10].

It varies from individual to individual about their preference to workout at home or working out in a gymnasium [4]. Dogan, in his research, on the other hand, explains that participants at the gym said that working out in the gym made them feel more active, mentally healthy and productive. In actuality, a gym gives a social environment and an opportunity to network with people and helps them stay motivated for longer [3]. All the literature available over the internet supports working out for better health and improved body composition.

Methods

Research Design

This study was based on a comparative design in which each study subject participated for 4 weeks. Each subject was evaluated after seven days (i.e., one week) for different variables: weight, height, socio-economic status, Body Mass Index (BMI), waist circumference, waist to hip ratio, basal energy expenditure, total energy expenditure, blood pressure, heart rate, and respiratory rate. Subjects were informed about the study and verbal consent was taken, including the volunteer's declaration and confidentiality of their details. Participants were instructed for weekly follow-up and recording of data. Variables that differ after and before the workout were recorded right before the exercise session and after finishing the exercise program. Diet was also analyzed through 24-hour dietary recall for three days a week. The social status of the subjects was measured through the Macarthur Scale of Subjective Social Status on the scale of 1 to 10, where one stands for lower socio-economic status while ten ranks for the highest socio-economic status in society.

Sampling

The sample for our study comprised 100 participants divided into two main groups. Group I was people working out in the gym, and Group II was people exercising at home. Both the groups were performing their workouts under the supervision of a professional trainer. Next, both groups were

divided into two areas, i.e., Valencia Town and Gulberg in Lahore, Pakistan. To summarize, 25 participants were taken from "Shoaib Gym" in Gulberg and 25 participants from "Workout Fitness Gym" in Valencia Town. Similarly, 25 participants from Valencia worked out at home, and 25 from Gulberg performed home-based exercises. The reason for this division was to create a difference in socio-economic status among participants. Our study subjects were from the age ranges of 19 to 39 years, both males and females. Our emphasis was on collecting data from primarily overweight and obese individuals, but we also included weight according to healthy BMI ranges. Older population groups and people with any disabilities were excluded.

Data Collection Tools

1. Body Impedance Analysis (BIA) machine of Omoron brand and model number bf508.
2. Standard Inches Tape
3. Sphygmomanometer
4. 3 Days Dietary Recall
5. Macarthur's subjective social status ladder
6. Harris-Benedict Equation for Basal Energy Expenditure

Data Collection Procedure

Four members of our research group divided the data collection task, and each researcher was assigned, 25 participants. On the first day of data collection, personal, demographic and social status was recorded, after which waist circumference was noted using a standard inch’s tape. Bodyweight, visceral fat%, general body fat% were recorded using the BIA Omron machine. Participants' age, height and gender were added to the machine. Then they were told to stand on it barefooted while holding its handgrip at a right angle for 15 -20 seconds while the weight was recorded and the body and visceral fat is analyzed. Each participant's form noted the readings, weight, BMI, visceral fat percentage, and general body fat percentage. Blood pressure was noted using a sphygmomanometer. Pulse rate was counted using first and second fingertips over the subject's wrist for 15 seconds and then multiplied by 4. The respiratory rate was calculated by seating the subject on a chair and counting the inhalation and exhalation

for 60 seconds. In the end, the subject was interviewed briefly and asked to report a 3-day dietary recall accurately. After seven days, this data collection procedure was repeated with every subject and noted down on forms to minimize error.

Data Analysis

After collecting data, it was tabulated, analyzed, and interpreted for each category of the respondent. Data were analyzed by MS. Excel and SPSS (statistics) software.

Results

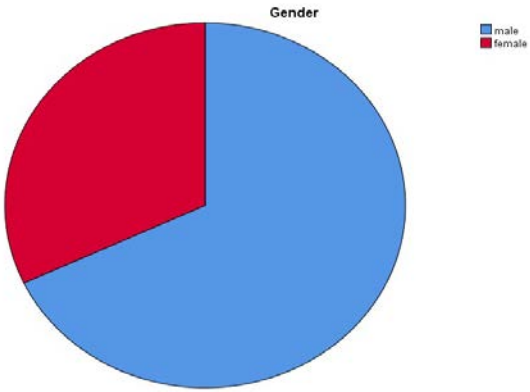

Figure 1. Gender Distribution in the Study

The pie chart shows the percentages of gender in our study sample. 68% study

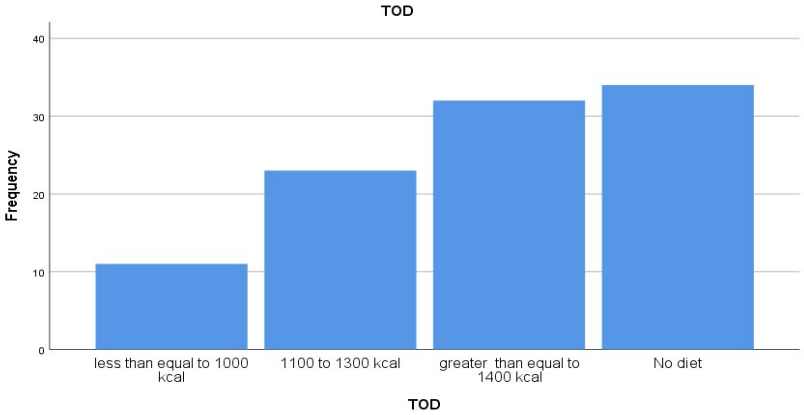

Figure 2. Types of Diet Consumed by Participants

The bar chart showed the frequencies of different types of diet among subjects. Mostly the participants were not taking any diet or were taking greater than equal to 1400 kcals per day.

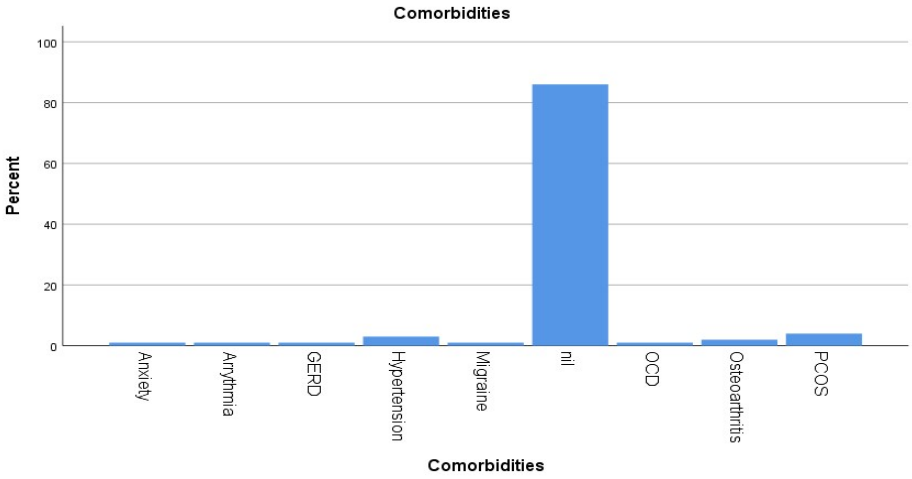

Figure 3. Comorbidities among Study Participants

The graph shows percentages of different comorbidities among study participants. 86% of participants did not have any comorbidities, 4% had PCOS, and 3% had hypertension.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Avg_WaistCircumference	Equal variances assumed	5.706	.019	.509	98	.612	.64360	1.26433	-1.86541	3.15262
	Equal variances not assumed			.517	63.809	.607	.64360	1.24504	-1.84380	3.13101
Avg_BodyFat	Equal variances assumed	7.253	.008	-2.597	98	.011	-3.70109	1.45594	-6.67036	-.09183
	Equal variances not assumed			-2.581	88.058	.011	-3.78109	1.46472	-6.69188	-.87030
Avg_VisceralFat	Equal variances assumed	16.182	.000	-1.121	98	.265	-.76080	.67862	-2.10750	.58589
	Equal variances not assumed			-1.109	72.966	.271	-.76080	.68622	-2.12846	.60685
Avg_BodyMassIndex	Equal variances assumed	6.017	.016	2.470	98	.015	3.43858	1.42088	.61888	6.25828
	Equal variances not assumed			2.451	71.639	.017	3.43858	1.40266	.64210	6.23497
Avg_WaisttoHipratio	Equal variances assumed	.091	.764	-.302	98	.764	-.00508	.01684	-.03849	.02833
	Equal variances not assumed			-.302	97.968	.763	-.00508	.01682	-.03845	.02829
Avg_HeartRate	Equal variances assumed	1.244	.267	7.299	98	.000	18.44428	2.52708	13.42936	23.45920
	Equal variances not assumed			7.344	91.551	.000	18.44428	2.51161	13.45568	23.43288
Avg_RespiratoryRate	Equal variances assumed	.002	.969	9.671	98	.000	10.60908	1.10530	8.49620	12.00347
	Equal variances not assumed			9.765	81.897	.000	10.68988	1.09473	8.51207	12.86768
Avg_BP	Equal variances assumed	12.479	.001	-6.472	98	.000	-5.40466	.83505	-7.06178	-3.74754
	Equal variances not assumed			-6.526	86.001	.000	-5.40466	.82815	-7.05096	-3.75836

Figure 4. Comparison of Health Parameters with Gym and Hoe

Workout

There were significant differences in waist circumference in the gym vs. home-based workouts, which showed that people who go to the gym have more Waist circumference. Body fat percentage was significant, which showed that people who do home-based workouts have more body fat. Visceral fat percentage was significant, which showed that people who do home-based workouts have more visceral fat. The Body Mass Index is significantly greater for those who go to the gym. Blood Pressure significance showed that people who do home-based workouts have Higher Blood pressure. There were no significant differences in the waist to hip ratio, heart rate, and Respiratory Rate.

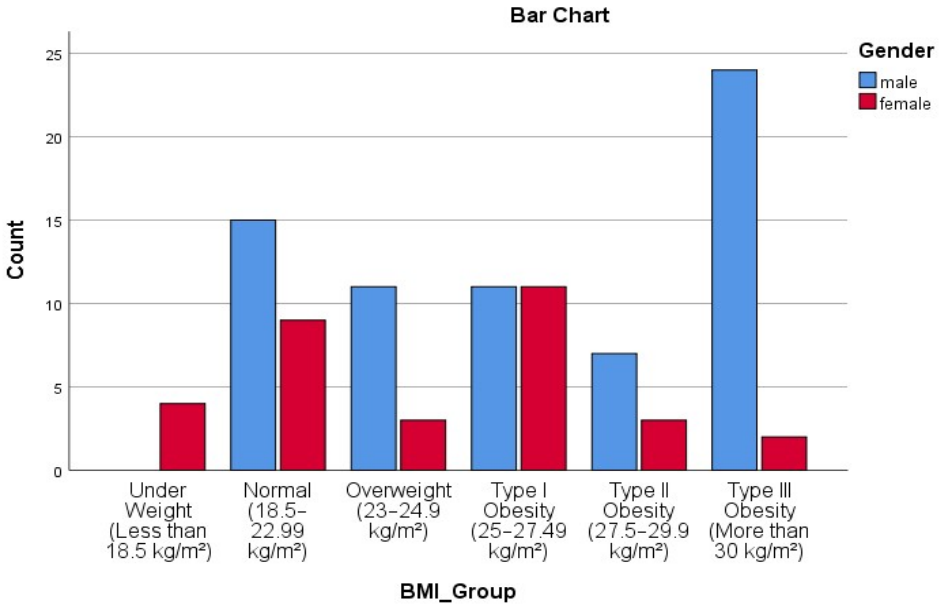

Figure 5. Gender-wise Distribution of Subjects according to Different BMI Ranges

In the category of underweight, four females only fall. Out of 24 subjects with normal BMI, there are fifteen males and nine females in total. Out of 14 subjects overweight, there are 11 males and three females. Out of 22 subjects of obesity Type I, there are 11 males, and 11 females exist. In the obesity type II category, there are seven males and three females, making 10 participants. In the last category, obesity type III, there are 24 males and two females with 26 participants in total. The results show that most male subjects fall under type III obesity, and most females are in type I obesity. The output is also shown in figure 11 below.

Table 1. Association of BMI and Gnder

	Value	**df**	**Asymptotic significance (2sided)**
Pearson Chi-Square	19.907a	5	.001
Likelihood Ratio	22.253	5	.000

Linear-by-Linear Association	8.641	1	.003
N of Valid Cases	100		

The chi-square test shows .001 significance which means there is a significant association between BMI and gender.

Multiple Comparisons

Dependent Variable: Total_Energy_Expenditure

Hochberg

(I) type of diet	(J) type of diet	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
less than equal to 1000 kcal	1100 to 1300 kcal	443.67909*	134.08799	.008	83.8189	803.5393
	greater than equal to 1400 kcal	376.57806*	127.84201	.024	33.4806	719.6756
	No diet	386.65650*	126.87649	.018	46.1502	727.1628
1100 to 1300 kcal	less than equal to 1000 kcal	-443.67909*	134.08799	.008	-803.5393	-83.8189
	greater than equal to 1400 kcal	-67.10102	99.98921	.984	-335.4482	201.2462
	No diet	-57.02259	98.75174	.993	-322.0487	208.0036
greater than equal to 1400 kcal	less than equal to 1000 kcal	-376.57806*	127.84201	.024	-719.6756	-33.4806
	1100 to 1300 kcal	67.10102	99.98921	.984	-201.2462	335.4482
	No diet	10.07844	90.08826	1.000	-231.6970	251.8539
No diet	less than equal to 1000 kcal	-386.65650*	126.87649	.018	-727.1628	-46.1502
	1100 to 1300 kcal	57.02259	98.75174	.993	-208.0036	322.0487
	greater than equal to 1400 kcal	-10.07844	90.08826	1.000	-251.8539	231.6970

*. The mean difference is significant at the 0.05 level.

Figure 6. Comparison of Calories and Types of Diet Comsumed

For further multiple comparison tests were used to check pairwise significance. The pairwise comparison results showed that the pair of less than equal to 1000 kcal' and 1100 to 1300 kcal were found to be significantly different. The total energy expenditure of those with less than equal to 1000 kcal of diet was higher than those with 1100 to 1300 kcal of diet.

Whereas the pair greater than equal to 1400 kcal and less than equal to 1000 kcal were negatively and significantly different. The total energy expenditure of those with less than equal to 1000 kcal of diet was higher than those with greater than equal to 1400 kcal of diet. Whereas, the pair of No diet and less than equal to 1000 kcal was found to be negatively and significantly different, which showed that the total energy expenditure of those with No diet was lower than those with less than equal to 1000 kcal of diet. Conclusively, the total energy expenditure of those with No diet, 1100 to 1300 kcal and greater than 1400 kcal was lower than those with "less than equal to 1000 kcal".

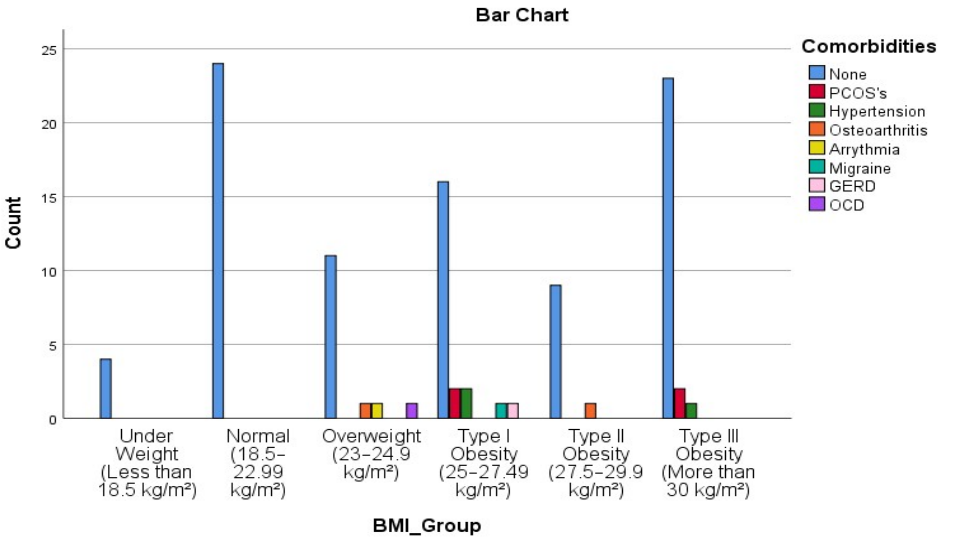

Figure 7. Relationship of BMI and Comorbidities

The results prove that there are associated comorbidities with increased body mass index starting from being overweight. Underweight and normalweight individuals do not show any comorbidities. It is concluded to stay in the normal BMI range to prevent oneself from different diseases.

Table 2. Association of BMI with Socio-Economic Status

	Value	df	Asymptotic significance (2-sided)
Pearson Chi-Square	8.169a	5	.147
Likelihood Ratio	9.497	5	.091
Linear-by-Linear Association	1.303	1	.254
N of Valid Cases	100		

The chi-square test results show an insignificant (2-sided) value of .147. We interpret that there is no significance between body mass index (BMI) and location, i.e., Gulberg and Valencia.

Discussion

The purpose of our study was to focus on two main parts, i.e., which exercise program gives better results, home workout or gym training and how caloric intake impacts weight loss in overweight and obese individuals. Our study

is the first of its kind in comparing the effectiveness of homebased workouts with gym training. Our study has many strengths like sample size, dietary recall with exercise, work out with a professional trainer, and social status check, but we could get more precise results if we had more time to conduct this study. The t-test carried out on the sample, as shown in results, elaborates that working out in the gym reduces body fat percentage and visceral fat percentage in the exerciser's body. The second most evident benefit of working out in the gym is reducing blood pressure, which suggests opting for a gym workout if you're suffering from hypertension. Our findings also suggest that individuals who want to reduce waist circumference and align their weight according to a healthy BMI range should go for a home-based workout.

Jones, in his study, researched that weight training leaves more impact on strength and improved muscle building rather than a fat reduction in the body [11]. At the same time, our study concludes that weight training in the gym lessens body and visceral fat levels.

A study in 2015 on weight training suggests that men who did weight training three times per week and 25 minutes a day had a significant effect on their waist circumference (WC). A marked decrease was seen in the waist measurements of men who were weight trained [12]. On the other hand, our research results show contrast that primarily weight-trained men had higher waist circumference than those who performed home workouts.

A study conducted on obese people showed results, that obese people should be recommended to do a combination of both jogging and circuit weight training as jogging has an impact on waist-to-hip ratio, blood pressure regulation and glucose metabolism. At the same time, CWT made flexible changes in the body and improved lipid profile [13]. Our research proves that weight training and home-based workouts have similar effects on the waist to hip ratio, heart rate, and respiratory rate.

This study provides evidence that with being overweight and obese, there are associated diseases that an individual is diagnosed. This finding of our research agrees with one of a survey that was held in the city of Karachi, Pakistan, which described the percentage of different diseases associated

with being obese, like 32.91% shown diabetes, 30.43% shown hypertension, 14.28% shown cardiovascular diseases, 10.55% shown bonerelated problems, 6.83% shown asthma, 6.21% shown migraine, 4.96% shown arthritis and 1.86% shown anemic [14]. In our study, the two most common diseases seen were polycystic ovarian syndrome (PCOS) and hypertension (HTN).

Another possibility our research ensured was the association of body mass index (BMI) with social status. There was no significant association found between these two variables [15]. In contrast to this finding, a prospective study on the association between socio-economic factors and obesity among Males in Punjab, Pakistan showed that higher socio-economic status led to higher body mass index because of more consumption of meals from outside the home.

A study conducted to compare calories found that consuming a diet of 1200 kcals and physical activity five days a week produced greater weight loss in individuals. Our study findings support this that individual consuming ≥ 1000 had increased caloric expenditure than other higher caloric diets [16]. This finding reinforces the second objective of our study, i.e., how caloric intake impacts weight loss. We conclude that consuming fewer calories or going to a caloric deficit diet of approximately 1000 – 1200 kcal per day with physical activity aids body fat loss and weight changes.

Study Limitations the first limitation is the minimal time frame to conduct research. In addition, due to the Coronavirus pandemic, subjects were hesitant in reporting data on follow-ups, especially those working out at home. Furthermore, despite being popular in many commercial gyms and within epidemiological research on group studies, body composition BIA does not appear to provide a valid single or repeated measure of body composition for athletes.

Conclusion

Our research concluded that both gym and home-based workouts have their benefits, and we cannot label one as more beneficial. But people who work out in the gym have lesser body fat and lesser visceral fat, which gives it more significance. Moreover, gym workouts proved to lower blood pressure

in individuals. Both gym and home workouts have almost similar effects on the waist to hip ratio, heart rate and respiratory rate. The benefit of home workouts is evident in waist circumference; people working out at home had a smaller waist than people working out in gyms.

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