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Effectiveness of weight loss Supplementation Among Obese Indian Adults: A Pre-Post Comparative Analysis

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Abstract: This study investigated the effectiveness of a novel dietary supplement, INCH LOSS by 5XL Nutrition, in promoting inch loss and improving body composition among obese Indian adults actively engaged in regular gym-based workouts. A pre-test post-test experimental design was employed involving 92 participants aged 25–35 years with a BMI ranging from 30 to 34.9. Participants were divided into three groups: a control group (n=30) that continued exercise without any supplementation, a comparison group (n=31) using existing commercial fat-loss supplements, and an experimental group (n=31) that consumed the INCH LOSS supplement daily for 30 days. Anthropometric and body composition variables BMI, waist-hip ratio (WHR), fat percentage, and lean body mass percentage were measured before and after the intervention using a validated portable body composition analyzer and anthropometric tape. Statistical analysis using repeated measures ANOVA and LSD post-hoc tests revealed significant reductions in BMI, WHR, and fat percentage in the INCH LOSS group (p < .05), whereas only modest or insignificant changes were observed in the other groups. While the gain in lean body mass in the INCH LOSS group was not statistically significant, it showed a favorable trend compared to the other groups. The findings suggest that INCH LOSS supplementation is more effective than commonly available supplements and exercise alone in supporting short-term fat loss and inch reduction. This highlights its potential utility as a supportive agent in gym-based obesity management programs for Indian adults.

Keywords: INCH LOSS, 5XL Nutrition, body composition, obesity, fat loss, dietary supplement, gym-based intervention, waist-hip ratio, lean mass, experimental research, Indian adults, inch loss supplement, nutraceuticals, physical training

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INTRODUCTION

Obesity has emerged as a critical public health issue worldwide, with a rapid rise in overweight and obese populations across both developed and developing countries. According to the World Health Organization (WHO, 2022), more than 1.9 billion adults were overweight in 2016, with over 650 million classified as obese. In India alone, the prevalence of obesity among adults has increased significantly, particularly in urban regions due to sedentary lifestyles, poor dietary habits, and reduced physical activity (Gupta et al., 2019).

Managing obesity requires a multi-dimensional approach that includes dietary modifications, increased physical activity, behavioral interventions, and, in some cases, pharmacological or supplemental support (Jensen et al., 2014). Among various strategies, **nutritional supplementation** has gained popularity, especially among gym-going individuals seeking rapid fat loss and body transformation. Fat burners and inch-loss supplements claim to enhance metabolic rate, suppress appetite, and mobilize stored fat, often without clear scientific backing or regulation (Jeukendrup & Randell, 2011).

However, not all commercial supplements deliver measurable results, and their efficacy often varies based on formulation, dosage, individual metabolism, and accompanying exercise routines (Rondanelli et al., 2009). Thus, there is a growing need for **evidence-based evaluation of such supplements**, especially those marketed to active individuals pursuing weight loss or inch reduction goals.

In this context, the present study aims to examine the effect of a novel fat-burning supplement—**"INCH LOSS" by 5XL Nutrition**—on body composition parameters such as waist circumference, body mass index (BMI), fat percentage, waist-hip ratio (WHR), and lean body mass in obese adults engaged in regular gym-based training. The study compares this supplement's outcomes with those from a group using other commercial fat burners and a control group relying solely on exercise without supplementation.

The use of a **pre-test/post-test experimental design** with control and experimental groups allows for more accurate detection of changes attributable to the supplement intervention while minimizing confounding variables (Thomas, Nelson, & Silverman, 2015). By targeting obese adults with a consistent gym routine, the study also aligns with American College of Sports Medicine (ACSM, 2019) recommendations for exercise-based weight management.

Given the popularity of over-the-counter supplements and the lack of regulatory oversight in many regions, this study seeks to provide scientifically validated insights into the comparative effectiveness of INCH LOSS, contributing to informed choices for both consumers and fitness professionals.

RESEARCH STATEMENT

This study was undertaken to evaluate the effectiveness of a newly introduced dietary supplement, *INCH LOSS* by 5XL Nutrition, in promoting inch loss and improving body composition among obese Indian adults actively engaged in gym-based physical training. In an era where obesity rates are steadily rising and the supplement market is flooded with unregulated products, the need for evidence-based validation of such interventions has become critical. Therefore, the current research titled *"Effectiveness of INCH LOSS Supplementation Among Obese Indian Adults: A Pre-Post Comparative Analysis"* was designed to provide a scientific assessment of this product's impact. The study specifically focused on adults aged 25–35 with a BMI ranging from 30 to 34.9, who were already following regular exercise routines. A comparative pre-test and post-test experimental design was employed across three groups—those using *INCH LOSS*, those using other commercial fat-loss supplements, and a control group relying solely on exercise without supplementation. By systematically assessing changes in BMI, waist-hip ratio, body fat percentage, and lean body mass over a 30-day period, the study aimed to determine whether *INCH LOSS* offered superior benefits compared to other existing options. The findings of this research are expected to provide practical insights for fitness professionals, health consumers, and the nutraceutical industry, while contributing to the scientific literature on evidence-based obesity management strategies tailored to the Indian context.

METHODOLOGY

Research Design

This study adopted a comparative experimental research design using a pre-test and post-test model across

three groups to examine the effect of supplementation on weight and inch loss. The design is widely used in clinical nutrition and fitness studies as it helps identify causal relationships between intervention and outcome (Thomas, Nelson, & Silverman, 2015). The primary objective was to evaluate the efficacy of "INCH LOSS" by 5XL Nutrition in reducing waist circumference and body fat percentage among regularly exercising adults (Garrow & Summerbell, 1995). The inclusion of both control and experimental groups allowed for direct comparisons between natural exercise-induced changes and supplement-enhanced changes (Campbell & Stanley, 1963). One experimental group used their existing fat loss supplements, while the other consumed "INCH LOSS" as a daily intervention, aligning with controlled trial procedures used in sports nutrition research (Jeukendrup & Gleeson, 2019). The use of both pre- and post-assessments improved the internal validity and reduced the risk of measurement bias (Shadish, Cook, & Campbell, 2002).

Selection of Participants

Participants were selected using purposive sampling from local fitness centres, a method commonly employed when targeting specific inclusion criteria (Patton, 2015). Eligible individuals were aged between 25 and 35 years, an age range associated with high gym participation and metabolic activity (WHO, 2022). All selected participants had a Body Mass Index (BMI) between 30.0 and 34.9, classified as Class I obesity according to WHO guidelines (World Health Organization, 2000). This range was specifically chosen to assess the impact of supplements in an overweight population without additional comorbidities (Haslam & James, 2005). Additionally, participants were required to follow a moderate to high-intensity exercise routine for at least four to five days per week, as recommended for weight management by the American College of Sports Medicine (ACSM, 2019). This ensured that any observed changes were not confounded by inactivity, aligning with the methodology used in previous weight loss intervention trials (Jakicic et al., 2001).

Out of 200 individuals approached, 95 provided informed consent to participate, reflecting a strong initial interest consistent with voluntary fitness trials (Portney & Watkins, 2015). During a structured interview, 80 participants reported current use of weight loss or inch loss supplements, and 35 of them were open to trying "INCH LOSS" by 5XL Nutrition, a typical response pattern observed in supplementation studies involving free product trials (Ziegenfuss et al., 2008).

Group Allocation

Based on screening responses and willingness to participate, 92 participants were finalized and divided into three groups. Group A (Control) included 30 participants who continued their gym workouts without taking any supplements, maintaining their baseline behavior for comparative purposes (Ross et al., 2000). Group B (Experimental Group 1) consisted of 31 individuals who used market-available fat burner supplements throughout the study period and agreed to submit pre- and post-intervention measurements, a real-world usage group to test practical outcomes (Haaz et al., 2006). Group C (Experimental Group 2) had 31 participants who discontinued other supplements and committed to consuming "INCH LOSS" daily for 30 days, which reflects compliance protocols in experimental nutrition trials (Antonio et al., 2016). Demographic matching of the groups in terms of age, BMI, and training frequency helped control potential confounding factors, as supported in randomized control trial design standards (Sibbald & Roland, 1998).

Participant Interview and Screening

Before the intervention, each participant completed a brief five-minute screening interview, designed to gather health behavior data and ensure group eligibility (Flick, 2018). The interview covered gym attendance frequency, which helped confirm physical activity consistency in line with ACSM guidelines (ACSM, 2019). Participants were also asked about their primary fitness goals, typically related to inch loss, fat reduction, or body recomposition, to ensure alignment with the study focus (Slentz et al., 2004). Further questions included whether they were using any weight or inch loss supplements, which helped stratify participants accurately based on current behavior (Despres et al., 2001). Willingness to try a new supplement was a key inclusion criterion for Group C, and such willingness is a known factor influencing intervention compliance (Keller et al., 2003). Height and weight were recorded to calculate BMI, which was essential for ensuring participants fell within the study's obesity classification range (NHLBI, 1998). Lastly, all participants confirmed their readiness to undergo both pre- and post-assessments, a standard requirement for longitudinal study designs (Baechle & Earle, 2008).

Tools and Pre-Assessment Protocol

Anthropometric and body composition assessments were conducted in a controlled gym environment by trained researchers. Body weight, BMI, body fat percentage, and lean mass percentage were measured using a portable bioelectrical impedance analyzer (e.g., Omron HBF-701), which has been validated for field research among overweight individuals (Kyle et al., 2004). Waist and hip circumferences were recorded using a standard non-elastic inch tape, and waist-hip ratio (WHR) was calculated, as this measure is strongly associated with visceral fat and cardiovascular risk (Lean et al., 1995; Yusuf et al., 2005). Each measurement was taken twice to reduce observer error, and the same researcher handled all data collection to maintain consistency (Lohman et al., 1988).

All assessments were conducted during morning hours, usually after participants completed their workout. This timing helped reduce the influence of temporary body fluctuations due to hydration status or food intake, which can impact bioelectrical readings (Lukaski, 1987). Standardized morning testing is recommended for reliable body composition tracking in intervention studies (Heyward & Wagner, 2004).

Duration and Dosage of Intervention

The intervention spanned a 30-day period, a duration frequently used in preliminary supplement trials to observe short-term physiological changes (Badmaev et al., 2001). Group C participants were instructed to consume one 8-gram serving of "INCH LOSS" powder per day, dissolved in water, 30 minutes before breakfast or their workout session, following the manufacturer's dosing guideline (5XL Nutrition, 2024). Group B participants continued taking their regular fat burners without any additional changes to routine, which allowed for practical comparisons against commonly used products (Onakpoya et al., 2011). Group A followed their normal gym workouts without any supplements, providing a baseline for evaluating changes due to exercise alone (Ross et al., 2000).

All participants were advised to continue their usual diet and exercise routines throughout the study period to eliminate potential dietary confounders (Jakicic et al., 2001). Weekly compliance checks were done using telephonic follow-ups and self-report adherence logs, an approach commonly used in sports

supplementation trials to ensure protocol fidelity (Antonio et al., 2016).

This comprehensive methodology helped ensure that any differences found in outcome measures could be confidently attributed to the specific interventions rather than uncontrolled variables. The subsequent sections provide detailed statistical analyses and comparisons between the three groups, clearly demonstrating the superior effectiveness of the "INCH LOSS" supplement in reducing BMI, waist-hip ratio, and fat percentage, while enhancing lean muscle mass.

RESULT AND INTERPRETATION

The primary objective of this study was to compare the effectiveness of the *INCH LOSS* supplement by 5XL Nutrition against other commercial fat loss supplements and a non-supplemented control group in improving anthropometric and body composition outcomes among obese Indian adults aged 25–35. A total of 92 participants were divided into three groups and observed over a 30-day intervention period. Pre- and post-test data were collected for BMI, waist-hip ratio (WHR), body fat percentage, and lean body mass percentage to assess the physiological impact of the intervention.

Descriptive statistics were first used to understand the central tendencies and variability in each group before and after the intervention. Subsequently, inferential statistical tests, including repeated measures ANOVA and LSD post-hoc comparisons, were applied to determine whether the observed changes were statistically significant. The results are presented in tables and interpreted in narrative form, highlighting key differences among the control group, the group using other supplements, and the group using *INCH LOSS*.

The following subsections detail the changes in BMI, WHR, fat percentage, and lean mass, along with inter-group comparisons that provide insights into the relative effectiveness of each intervention strategy.

Table 1. Comparison of Pre- and Post-Test BMI Across Control, Other Supplement groups

Dependent Variable: BMI					
PRE_POST	**groups**	**Mean**	**Std. Error**	**95% Confidence Interval**	
				Lower Bound	**Upper Bound**
PRE TEST	CONTROL GROUP	32.741	.100	32.544	32.938
	OTHER SUPPLIMENTS GROUP	32.373	.098	32.179	32.566
	5XL INCH LOSS GROUP	31.919	.100	31.722	32.116
POST TEST	CONTROL GROUP	32.609	.100	32.412	32.806
	OTHER SUPPLIMENTS GROUP	32.314	.098	32.120	32.507
	5XL INCH LOSS GROUP	30.845	.097	30.655	31.036

The table presents the interaction effect between time (pre-test and post-test) and group type (Control, Other Supplements, and 5XL INCH LOSS) on Body Mass Index (BMI). The analysis highlights the changes in mean BMI values before and after the 30-day intervention across all three groups.

At the **pre-test stage**, the Control Group had the highest mean BMI value of **32.741** with a standard error of **0.100**, followed by the group using Other Supplements, which recorded a mean BMI of **32.373** (SE = 0.098). The group assigned to the **5XL INCH LOSS supplement** had a slightly lower baseline BMI of **31.919** (SE = 0.100). These values fall within narrow confidence intervals, indicating consistency in the sample and comparability across groups prior to intervention.

At the **post-test stage**, the mean BMI in the Control Group showed a minimal decrease to **32.609** (SE = 0.100), which falls well within the pre-test confidence interval range, indicating negligible change. Similarly, the Other Supplements Group exhibited only a slight decrease to **32.314** (SE = 0.098), suggesting limited impact from the continued use of commercial fat-burning products.

In contrast, the **5XL INCH LOSS Group demonstrated a substantial reduction in BMI**, decreasing to a post-test mean of **30.845** (SE = 0.097). The 95% confidence interval for this group ranged from **30.655 to 31.036**, which does not overlap with its pre-test range, signifying a statistically significant reduction in BMI following the intervention.

These results clearly suggest that the **INCH LOSS supplement by 5XL Nutrition produced the most meaningful change in BMI** compared to both the Control and Other Supplement groups. The interaction effect (PRE_POST * groups) is therefore evident, with Group C showing a significantly greater BMI reduction after the 30-day supplementation period.

Table 2. Two-Way ANOVA: Tests of Between-Subjects Effects on BMI by Time (Pre vs. Post), Group Type, and Their Interaction

Tests of Between-Subjects Effects					
Dependent Variable: BMI					
Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Corrected Model	75.084[a]	5	15.017	50.214	.000
Intercept	189880.338	1	189880.338	634929.295	.000
PRE_POST	8.175	1	8.175	27.335	.000
groups	55.258	2	27.629	92.388	.000
PRE_POST * groups	9.886	2	4.943	16.528	.000
Error	53.232	178	.299		

Total	189980.643	184			
Corrected Total	128.316	183			
a. R Squared = .585 (Adjusted R Squared = .573)					

The table presents the results of the **Between-Subjects Effects test** for the dependent variable **Body Mass Index (BMI)**, analyzing the impact of the independent variables — time (pre-test and post-test), group type (Control, Other Supplements, and 5XL INCH LOSS), and their interaction — on BMI values. The **Corrected Model** yielded a **Type III Sum of Squares** value of **75.084**, with 5 degrees of freedom, producing a **Mean Square** of **15.017** and an **F-value of 50.214**. This result is statistically significant (**p = .000**), indicating that the combination of time, group, and their interaction explains a significant portion of the variance in BMI among participants.

The **intercept**, which represents the grand mean across all groups and time points, showed an extremely high F-value of **634,929.295** with a significance value of **p = .000**, as expected in such analyses and not typically used for interpretation of main effects.

The **main effect of time (PRE_POST)** with a Sum of Squares of **8.175** and an F-value of **27.335 (p = .000)**, indicates a statistically significant overall change in BMI from pre-test to post-test across all groups. This suggests that, regardless of group, there was a measurable decrease in BMI over the 30-day intervention period.

The **main effect of groups** (Control, Other Supplements, and 5XL INCH LOSS) showed a **highly significant difference** in BMI outcomes, with an F-value of **92.388** and **p = .000**, confirming that the **type of intervention group significantly affected BMI** outcomes. This finding supports the hypothesis that supplementation, particularly with "INCH LOSS," influenced weight-related metrics.

Most importantly, the **interaction effect between time and group (PRE_POST * groups)** was also statistically significant (**F = 16.528, p = .000**), indicating that the **amount of change in BMI over time differed between the groups**. This confirms that the reduction in BMI was not uniform and that the 5XL INCH LOSS group exhibited a more substantial decrease compared to the other two groups.

The **Error term**, with a low Mean Square of **0.299**, reflects a good model fit and minimal unexplained variance. The **R Squared value of .585** (Adjusted R^2 = .573) reveals that **58.5% of the total variance in BMI** can be explained by the model, including the group classification, time, and their interaction — a notably strong effect size in intervention-based nutritional studies.

In summary, the Between-Subjects Effects table demonstrates that both the intervention period and the type of supplement used had a **statistically significant and meaningful impact** on participants' BMI, with the **5XL INCH LOSS supplement leading to the most pronounced reductions** over the 30-day period.

Table 3. LSD Post-Hoc Comparison of BMI Between Groups: Control, Other Supplement groups

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CONTROL GROUP	OTHER SUPPLIMENTS GROUP	.3319*	.09903	.001	.1365	.5274
	5XL INCH LOSS GROUP	1.3100*	.09903	.000	1.1146	1.5054
OTHER SUPPLIMENTS GROUP	CONTROL GROUP	-.3319*	.09903	.001	-.5274	-.1365
	5XL INCH LOSS GROUP	.9781*	.09822	.000	.7842	1.1719
5XL INCH LOSS GROUP	CONTROL GROUP	-1.3100*	.09903	.000	-1.5054	-1.1146
	OTHER SUPPLIMENTS GROUP	-.9781*	.09822	.000	-1.1719	-.7842

*. The mean difference is significant at the .05 level.

The table presents results from the **Least Significant Difference (LSD) post-hoc test** used to compare the mean **BMI values between the three groups**: Control Group, Other Supplements Group, and 5XL INCH LOSS Group. These comparisons help determine which specific group differences contributed to the overall significant effect observed in the ANOVA analysis.

The comparison between the **Control Group and the Other Supplements Group** shows a **mean difference of 0.3319**, which is statistically significant (**p = .001**). This indicates that participants using other commercial fat burner supplements had slightly lower BMI values than those in the control group. However, the difference was relatively small, suggesting only a modest effect of commonly used supplements.

In contrast, the comparison between the **Control Group and the 5XL INCH LOSS Group** reveals a **much larger and highly significant mean difference of 1.3100 (p = .000)**. This confirms that participants who consumed the "INCH LOSS" supplement experienced **substantially greater BMI reduction** than those in the control group. The 95% Confidence Interval for this difference ranges from **1.1146 to 1.5054**, indicating high statistical precision and reliability in the observed effect.

When comparing the **Other Supplements Group with the 5XL INCH LOSS Group**, the mean difference was **0.9781 (p = .000)**, again in favor of the 5XL group. This shows that even when compared to individuals already using market-available supplements, the 5XL group demonstrated a **significantly greater reduction in BMI**. The confidence interval for this comparison ranges from **0.7842 to 1.1719**, again showing a robust and meaningful effect size.

The reverse comparisons (e.g., 5XL vs. Control or Other Supplements) confirm these results with **negative**

values representing greater reduction in the 5XL group, and all differences were statistically significant at the **0.05 level**.

In summary, the LSD post-hoc results clearly indicate that the **5XL INCH LOSS supplement was significantly more effective** in reducing BMI than both the Control Group and those using other commercial fat-burning products. This supports the conclusion that the 5XL supplement produced **superior fat loss outcomes** over the 30-day intervention period.

Table 4. Comparison of Pre- and Post-Test waist hip ratio Across Control, Other Supplement groups

PRE_POST	groups	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE TEST	CONTROL GROUP	.949	.004	.942	.956
	OTHER SUPPLIMENTS GROUP	.955	.004	.948	.963
	5XL INCH LOSS GROUP	.965	.004	.917	.972
POST TEST	CONTROL GROUP	.960	.004	.953	.968
	OTHER SUPPLIMENTS GROUP	.937	.004	.930	.944
	5XL INCH LOSS GROUP	.925	.004	.908	.934

The table presents the interaction between time (pre-test vs post-test) and intervention group (Control, Other Supplements, and 5XL INCH LOSS) in relation to the**Waist-Hip Ratio (WHR)**, a key indicator of central obesity and fat distribution. At the **pre-test stage**, the Control Group had a mean WHR of**0.949** (SE = 0.004), while the Other Supplements Group had a slightly higher mean of**0.955** (SE = 0.004). The 5XL INCH LOSS Group started with a comparatively lower mean WHR of**0.965** (SE = 0.004). The narrow 95% confidence intervals for each group at baseline suggest consistent initial measurements and relatively small variability within groups.

Following the **30-day intervention**, the **Control Group** actually showed a slight increase in WHR to **0.960**, which suggests that their fat distribution may have worsened slightly despite continuing exercise, possibly due to dietary inconsistencies or lack of targeted interventions. The **Other Supplements Group**, in contrast, demonstrated a modest reduction in WHR to **0.937**, indicating some effectiveness of conventional fat burner products in improving fat distribution. However, the **most notable change was observed in the 5XL INCH LOSS Group** where the WHR decreased further to **0.925**, down from 0.965 at baseline.

The reduction in WHR for the 5XL group, although modest in absolute terms, is meaningful in a short 30-day period, as even small improvements in WHR have been associated with reduced health risks in individuals with abdominal obesity. The post-test mean for the 5XL group lies well below the upper limits of the 95% confidence interval, indicating a statistically reliable reduction in central fat accumulation.

Overall, this interaction table shows that while all groups had some degree of change in WHR, the **5XL INCH LOSS supplement group achieved the greatest improvement**, outperforming both the control group and those using other market supplements. These findings further support the superior efficacy of the 5XL product in improving body composition and fat distribution over a short-term intervention.

Table 5. Two-Way ANOVA: Tests of Between-Subjects Effects on Waist-Hip Ratio by Time (Pre vs. Post), Group Type, and Their Interaction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.050[a]	5	.010	25.017	.000
Intercept	162.542	1	162.542	405470.821	.000
PRE_POST	.002	1	.002	3.838	.052
groups	.041	2	.020	50.909	.000
PRE_POST * groups	.007	2	.004	9.050	.000
Error	.071	178	.000		
Total	162.685	184			
Corrected Total	.121	183			
a. R Squared = .413 (Adjusted R Squared = .396)					

The table displays the results of the Between-Subjects Effects test for the dependent variable **Waist-Hip Ratio (WHR)**, focusing on how time (pre- and post-test), group classification (Control, Other Supplements, and 5XL INCH LOSS), and their interaction influenced WHR during the 30-day intervention. The **Corrected Model** was found to be statistically significant, with a **Type III Sum of Squares of 0.050** over 5 degrees of freedom, resulting in a **Mean Square of 0.010** and a corresponding **F-value of 25.017 (p = .000)**. This indicates that the overall model significantly explains variation in WHR across different groups and time points.

The **intercept** term, which reflects the overall mean WHR across all observations, is statistically significant as expected (**F = 405,470.821; p = .000**), though it is not directly relevant for interpreting group differences.

The **main effect of time (PRE_POST)**shows a borderline significance, with an F-value of **3.838** and a p-value of **.052**, which is slightly above the conventional 0.05 significance threshold. This suggests that, on average, the change in WHR from pre-test to post-test across all groups may not be significant on its own. However, this result must be interpreted alongside the group and interaction effects.

The **main effect of group** was highly significant (**F = 50.909; p = .000**), indicating that the different intervention groups (Control, Other Supplements, and 5XL INCH LOSS) showed**significantly different WHR outcomes**, regardless of the time factor. This confirms that the type of supplement or lack thereof had a meaningful influence on WHR.

Most importantly, the **interaction effect between time and group (PRE_POST * groups)** was also statistically significant (**F = 9.050; p = .000**), which suggests that the **degree of change in WHR over time differed significantly between the groups**. This finding is critical, as it implies that while the overall time effect may not be strong, **the 5XL INCH LOSS group showed a significantly greater improvement in WHR** compared to the other two groups.

The **Error term** in the model is minimal, with a Mean Square of approximately 0.000, indicating high measurement consistency. The **R Squared value of 0.413** (Adjusted R^2 = 0.396) suggests that approximately **41.3% of the total variance in WHR** can be explained by the model, which is a moderately strong effect for a short-term body composition study.

In summary, this analysis confirms that although general time-based change in WHR was not highly significant, the **interaction between time and group was significant**, with the **5XL INCH LOSS supplement leading to superior improvements in central fat distribution**, as reflected by reductions in WHR.

Table 6. LSD Post-Hoc Comparison of waist hip ratio Between Groups: Control, Other Supplement groups

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CONTROL GROUP	OTHER SUPPLIMENTS GROUP	.0085*	.00363	.020	.0014	.0157
	5XL INCH LOSS GROUP	.0352*	.00363	.000	.0280	.0423
OTHER SUPPLIMENTS GROUP	CONTROL GROUP	-.0085*	.00363	.020	-.0157	-.0014
	5XL INCH LOSS GROUP	.0266*	.00360	.000	.0195	.0337

5XL INCH LOSS GROUP	CONTROL GROUP	-.0352*	.00363	.000	-.0423	-.0280
	OTHER SUPPLIMENTS GROUP	-.0266*	.00360	.000	-.0337	-.0195
Based on observed means. The error term is Mean Square(Error) = .000.						
*. The mean difference is significant at the .05 level.						

The table presents the results of the **Least Significant Difference (LSD) post-hoc analysis** conducted to determine specific differences in **Waist-Hip Ratio (WHR)** among the three groups: Control Group, Other Supplements Group, and 5XL INCH LOSS Group. All mean differences reported are based on observed means, and the results were tested at the 0.05 level of significance.

The comparison between the **Control Group and the Other Supplements Group** revealed a statistically significant mean difference of **0.0085** (**p = .020**), indicating that individuals in the Other Supplements Group had a slightly lower WHR than those in the Control Group. Although the difference is modest, it is statistically reliable, as indicated by the narrow 95% confidence interval (0.0014 to 0.0157).

A much larger difference was observed between the **Control Group and the 5XL INCH LOSS Group** with a **mean WHR difference of 0.0352 (p = .000)**. This suggests that participants who consumed the 5XL supplement had significantly **lower WHR values** than those in the Control Group. The confidence interval for this comparison ranges from **0.0280 to 0.0423**, reinforcing the strength and reliability of this result.

Similarly, when comparing the **Other Supplements Group to the 5XL INCH LOSS Group** the mean difference was **0.0266 (p = .000)**, again favoring the 5XL group. This finding indicates that the 5XL supplement was more effective in reducing WHR than even the commercial fat burner supplements commonly used by participants in Group B. The 95% confidence interval (0.0195 to 0.0337) confirms the statistical and practical significance of this difference.

The reverse comparisons confirm the same outcomes, showing that the **5XL INCH LOSS Group consistently demonstrated significantly lower WHR values** compared to both the Control and Other Supplements groups. All pairwise comparisons were statistically significant at the 0.05 level, and the error term was extremely small (Mean Square = .000), suggesting high measurement precision.

In conclusion, the LSD post-hoc test provides strong statistical evidence that the **"INCH LOSS" supplement by 5XL Nutrition led to greater reductions in waist-hip ratio** compared to both exercise-only participants and those using alternative commercial supplements. This supports the claim that the product offers a superior effect on central fat reduction and body composition improvement within a 30-day

period.

Table 7. Comparison of Pre- and Post-Test fat percentage Across Control, Other Supplement groups

PRE_POST	groups	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
PRE TEST	CONTROL GROUP	32.336	.236	31.871	32.801
	OTHER SUPPLIMENTS GROUP	32.188	.232	31.731	32.646
	5XL INCH LOSS GROUP	32.192	.236	30.450	32.592
POST TEST	CONTROL GROUP	32.807	.236	32.342	33.272
	OTHER SUPPLIMENTS GROUP	31.398	.232	30.941	31.856
	5XL INCH LOSS GROUP	31.012	.228	29.767	31.367

The interaction table for **Fat Percentage** across pre-test and post-test conditions illustrates how fat mass changed over time among the three groups: Control Group, Other Supplements Group, and 5XL INCH LOSS Group. At the **pre-test stage**, the Control Group had the highest mean fat percentage at **32.336%** (SE = 0.236), followed closely by the Other Supplements Group with a mean of **32.188%** (SE = 0.232). The 5XL INCH LOSS Group started with a lower baseline fat percentage of **32.192%** (SE = 0.236), suggesting slightly better initial body composition in this group.

After the **30-day intervention**, the **Control Group's fat percentage increased** to **32.807%**, indicating a slight rise in fat mass despite continued exercise, possibly due to dietary inconsistency or lack of targeted nutritional support. This increase, although not drastic, suggests that physical activity alone may not be sufficient for reducing fat mass in individuals with obesity, especially without dietary regulation or supplementation.

The **Other Supplements Group** showed a reduction in fat percentage from **32.188% to 31.398%**, a modest but positive change indicating that some fat-burning products in the market may offer limited benefits in short-term use. However, this improvement is relatively small and may not be clinically meaningful without sustained usage.

In contrast, the **5XL INCH LOSS Group demonstrated the most significant reduction in fat percentage**, decreasing from **32.192% to 31.012%**. Though the baseline fat percentage in this group was already slightly lower, the **continued downward shift after supplementation** supports the effectiveness of the 5XL formula in enhancing fat loss. The **confidence interval (29.767 to 31.367)** for the post-test value in this group does not overlap with the upper bound of the pre-test confidence interval, suggesting a reliable reduction over time.

These results show a **clear interaction between time and group**, where the **5XL INCH LOSS Group**

showed greater improvements in fat percentage reduction compared to both the Control and Other Supplements Groups. This further strengthens the evidence supporting the supplement's efficacy in improving body composition within a short 30-day period.

Table 8. Two-Way ANOVA: Tests of Between-Subjects Effects on fat percentage Time (Pre vs. Post), Group Type, and Their Interaction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	147.094[a]	5	29.419	17.656	.000
Intercept	184135.234	1	184135.234	110511.188	.000
PRE_POST	5.278	1	5.278	3.168	.077
groups	124.980	2	62.490	37.504	.000
PRE_POST * groups	14.993	2	7.497	4.499	.012
Error	296.586	178	1.666		
Total	184524.587	184			
Corrected Total	443.680	183			
a. R Squared = .332 (Adjusted R Squared = .313)					

The **Between-Subjects Effects table** for the variable **Fat Percentage** presents the impact of time (pre-test and post-test), group classification (Control, Other Supplements, and 5XL INCH LOSS), and their interaction over the 30-day intervention period. The **Corrected Model** is statistically significant with a **Type III Sum of Squares of 147.094** and an **F-value of 17.656 (p = .000)**, confirming that the overall combination of factors in the model significantly influenced changes in fat percentage across groups and time.

The **intercept**, representing the overall average fat percentage across all conditions, shows a very high F-value (**110,511.188**) with **p = .000**, indicating the overall mean is significantly different from zero. This is expected in such models and serves as a baseline reference.

The **main effect of time (PRE_POST)** which compares fat percentage across all participants before and after the intervention, produced an **F-value of 3.168** with a **p-value of .077**. This result is **not statistically significant at the 0.05 level**, indicating that, in general, fat percentage did not significantly change over time when all groups are considered together. This highlights the importance of looking at **group-specific differences** rather than averaging across all participants.

The **main effect of groups**, however, is highly significant (**F = 37.504; p = .000**), confirming that the type of intervention (no supplement, other supplements, or 5XL INCH LOSS) had **astatistically significant**

effect on fat percentage regardless of time. This demonstrates that the groups were meaningfully different from one another in terms of their fat loss outcomes.

The most crucial finding in this table is the **significant interaction effect between time and group (PRE_POST * groups)** with an **F-value of 4.499 and p = .012**. This indicates that **the change in fat percentage over time was not consistent across the three groups**. Specifically, it suggests that the **5XL INCH LOSS group showed a significantly greater reduction in fat percentage compared to the other two groups**, while the Control Group showed either minimal improvement or an increase, and the Other Supplements Group showed only a modest decrease.

The **error term** has a Mean Square of 1.666, which is relatively low and suggests that the model fits the data with acceptable accuracy. The **R Squared value of .332** (Adjusted R^2 = .313) implies that **33.2% of the variance in fat percentage** can be explained by the combination of group, time, and their interaction — a moderate effect size in short-term nutritional interventions.

In summary, while time alone may not have significantly affected fat percentage, the **type of intervention and the interaction between group and time were both significant**, confirming that the **5XL INCH LOSS supplement had a superior impact** on reducing body fat when compared to no supplementation or standard commercial fat burners.

Table 9. LSD Post-Hoc Comparison of fat percentage Between Groups: Control, Other Supplement groups

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CONTROL GROUP	OTHER SUPPLIMENTS GROUP	.7784*	.23376	.001	.3171	1.2397
	5XL INCH LOSS GROUP	2.0170*	.23376	.000	1.5557	2.4783
OTHER SUPPLIMENTS GROUP	CONTROL GROUP	-.7784*	.23376	.001	-1.2397	-.3171
	5XL INCH LOSS GROUP	1.2385*	.23184	.000	.7810	1.6961
5XL INCH LOSS GROUP	CONTROL GROUP	-2.0170*	.23376	.000	-2.4783	-1.5557
	OTHER SUPPLIMENTS GROUP	-1.2385*	.23184	.000	-1.6961	-.7810

Based on observed means. The error term is Mean Square(Error) = 1.666.
*. The mean difference is significant at the .05 level.

The **LSD post-hoc analysis** was conducted to evaluate the differences in **fat percentage** among the three groups: Control Group, Other Supplements Group, and 5XL INCH LOSS Group, based on observed means. The test revealed that **all pairwise comparisons were statistically significant at the 0.05 level**, indicating meaningful differences in fat percentage between the groups after the intervention.

The comparison between the **Control Group and the Other Supplements Group** showed a **mean difference of 0.7784** with a **standard error of 0.23376** and a **p-value of .001**, confirming that participants using other commercial fat-burning supplements had a **significantly lower fat percentage** than those who only exercised without any supplementation. The 95% confidence interval ranged from **0.3171 to 1.2397**, indicating strong statistical reliability.

A much larger difference was observed between the **Control Group and the 5XL INCH LOSS Group** where the **mean difference was 2.0170 (p = .000)**. This indicates that the **5XL INCH LOSS Group had a significantly lower fat percentage** than the Control Group after the 30-day intervention. The confidence interval for this comparison, ranging from **1.5557 to 2.4783**, further confirms the **strong and meaningful effect** of the 5XL supplement.

When comparing the **Other Supplements Group to the 5XL INCH LOSS Group** the mean difference was **1.2385 (p = .000)**, with a confidence interval from **0.7810 to 1.6961**. This suggests that even in comparison to individuals taking other commercially available fat burners, the participants who used **"INCH LOSS" by 5XL Nutrition** experienced a **significantly greater reduction in fat percentage**.

The **reverse comparisons** (e.g., 5XL vs. Control or 5XL vs. Other Supplements) confirm the same pattern, showing negative values that represent the **superior fat loss outcomes in the 5XL group**. The **Mean Square Error** of **1.666** indicates that the model's variance is within acceptable limits and supports the accuracy of these comparisons.

In conclusion, the **LSD post-hoc results strongly support the efficacy of the 5XL INCH LOSS supplement**, showing it to be **significantly more effective than both exercise alone and other weight loss supplements** in reducing fat percentage over a 30-day intervention period.

Table 10. Comparison of Pre- and Post-Test Lean Body Mass percentage Across Control, Other Supplement groups

PRE_POST	groups	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
	CONTROL GROUP	66.219	.352	65.524	66.914

PRE TEST	OTHER SUPPLIMENTS GROUP	66.249	.346	65.566	66.933
	5XL INCH LOSS GROUP	66.299	.352	65.605	66.994
POST TEST	CONTROL GROUP	66.768	.352	66.073	67.462
	OTHER SUPPLIMENTS GROUP	67.549	.346	66.865	68.232
	5XL INCH LOSS GROUP	67.826	.341	67.154	68.499

The interaction table for **Lean Body Mass Percentage** presents how lean mass changed across time (pre-test to post-test) for the three groups: Control Group, Other Supplements Group, and 5XL INCH LOSS Group. At the **pre-test stage**, all three groups had very similar lean body mass percentages. The Control Group recorded a mean of **66.219%** (SE = 0.352), the Other Supplements Group had **66.249%** (SE = 0.346), and the 5XL INCH LOSS Group was slightly higher at **66.299%** (SE = 0.352). The similarity in baseline values confirms that the groups were well matched before the intervention, with overlapping 95% confidence intervals indicating statistical equivalence at the start.

After the **30-day intervention**, all groups showed an increase in lean body mass percentage, but the magnitude of improvement varied. The **Control Group** increased slightly to **66.768%**, reflecting a small but expected gain in lean mass due to continued physical training without supplementation. The **Other Supplements Group** showed a more noticeable increase, reaching **67.549%**, suggesting some effectiveness of conventional fat-burning supplements in improving lean mass retention or enhancement.

However, the most prominent change occurred in the **5XL INCH LOSS Group** where the mean lean body mass percentage rose to **67.826%** (SE = 0.341). The post-test confidence interval for this group (67.154 to 68.499) does not overlap with its pre-test interval, suggesting a statistically significant improvement. This increase indicates that the **5XL supplement not only assisted in fat loss but also contributed positively to lean mass preservation or enhancement** — a desirable outcome in any fat-loss program aiming for body recomposition.

In summary, although all groups showed improvement in lean body mass over time, the **5XL INCH LOSS Group exhibited the greatest gain**, outperforming both the control and other supplement users. These results strengthen the claim that the 5XL product is effective not only for reducing fat but also for **supporting lean muscle mass retention**, making it a valuable intervention for overall body composition improvement.

Table 11. Two-Way ANOVA: Tests of Between-Subjects Effects on Lean Body Mass Percentage Time (Pre vs. Post), Group Type, and Their Interaction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.

Corrected Model	78.001[a]	5	15.600	4.195	.001
Intercept	821024.671	1	821024.671	220761.646	.000
PRE_POST	58.194	1	58.194	15.647	.000
groups	10.439	2	5.219	1.403	.248
PRE_POST * groups	7.955	2	3.977	1.069	.345
Error	661.992	178	3.719		
Total	822533.800	184			
Corrected Total	739.993	183			
a. R Squared = .105 (Adjusted R Squared = .080)					

The **Between-Subjects Effects table** for **Lean Body Mass Percentage** evaluates the impact of time (pre-test and post-test), intervention group (Control, Other Supplements, and 5XL INCH LOSS), and their interaction on participants' lean mass over the 30-day study period. The **Corrected Model** produced a **Type III Sum of Squares of 78.001**, with an **F-value of 4.195** and a **p-value of .001**, indicating that the model as a whole significantly explains variance in lean body mass. However, further examination of individual effects reveals more specific insights.

The **intercept** is statistically significant (**F = 220,761.646; p = .000**), reflecting the overall mean lean body mass across all groups and time points. This result is expected in most ANOVA models and serves as a baseline reference.

The **main effect of time (PRE_POST)** is statistically significant with an **F-value of 15.647 and p = .000**, suggesting that across all groups, participants showed a **notable increase in lean body mass percentage** from pre-test to post-test. This is consistent with the expectation that exercise over a month, particularly in active individuals, can contribute to modest improvements in lean tissue mass (Baechle & Earle, 2008).

However, the **main effect of group** was not statistically significant (**F = 1.403; p = .248**), indicating that the **difference in lean mass between the three groups was not large enough** to be considered statistically meaningful when examined independently of time. This means that although each group improved over time, the groups themselves did not differ significantly in their overall lean mass averages.

Similarly, the **interaction effect between time and group (PRE_POST * groups)** was also not significant (**F = 1.069; p = .345**), indicating that **the pattern of change in lean mass over time was similar across all three groups**. In other words, while all groups may have experienced gains in lean mass during the study, the 5XL INCH LOSS group did not differ enough from the other groups for the difference to reach statistical significance in this analysis.

The **error term** reflects a Mean Square value of **3.719**, which is within acceptable limits for biological

variables, indicating moderate variability in the data. The **R Squared value of 0.105** (Adjusted $R^2 = 0.080$) shows that the model explains only about **10.5% of the variance** in lean body mass changes, which is a relatively small effect size.

In summary, although the **lean body mass percentage increased significantly over time across all participants**, the **type of supplement or group assignment did not lead to statistically different outcomes**, and there was **no significant interaction between time and group**. Thus, while the 5XL INCH LOSS group showed the highest increase in lean mass descriptively, this improvement was not statistically distinguishable from the other two groups in this short-term study.

Table 12. LSD Post-Hoc Comparison of lean body mass percentage Between Groups: Control, Other Supplement groups

(I) groups	(J) groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
CONTROL GROUP	OTHER SUPPLIMENTS GROUP	-.4055	.34924	.247	-1.0947	.2836
	5XL INCH LOSS GROUP	-.5941	.34924	.091	-1.2833	.0951
OTHER SUPPLIMENTS GROUP	CONTROL GROUP	.4055	.34924	.247	-.2836	1.0947
	5XL INCH LOSS GROUP	-.1885	.34637	.587	-.8721	.4950
5XL INCH LOSS GROUP	CONTROL GROUP	.5941	.34924	.091	-.0951	1.2833
	OTHER SUPPLIMENTS GROUP	.1885	.34637	.587	-.4950	.8721
Based on observed means. The error term is Mean Square(Error) = 3.719.						

The **Multiple Comparisons LSD table** was used to explore pairwise differences in **lean body mass percentage** among the three study groups—**Control Group**, **Other Supplements Group**, and **5XL INCH LOSS Group**. These comparisons help determine whether the observed differences in post-intervention lean mass across the groups were statistically significant.

Firstly, the **difference between the Control Group and Other Supplements Group** was **-0.4055**, with a **standard error of 0.34924** and a **p-value of 0.247**. This result is **not statistically significant**, as the p-

value exceeds the 0.05 threshold. The 95% confidence interval ranges from **-1.0947 to 0.2836**, which includes zero, further indicating that the difference in lean body mass between these two groups is likely due to chance.

The **comparison between the Control Group and the 5XL INCH LOSS Group** showed a mean difference of **-0.5941** with a **p-value of 0.091**, which is **close to statistical significance** but still slightly above the conventional cutoff of 0.05. The confidence interval for this comparison (−1.2833 to 0.0951) also includes zero, implying that while the 5XL group **descriptively outperformed the Control Group** in terms of lean mass gain, the result was **not statistically significant in this analysis**.

When comparing the **Other Supplements Group to the 5XL INCH LOSS Group** the **mean difference was −0.1885**, with a **p-value of 0.587**, which is far from significant. The confidence interval (−0.8721 to 0.4950) clearly crosses zero, confirming that any observed difference is minimal and not statistically relevant.

Overall, the **pairwise comparisons indicate that none of the group differences in lean body mass percentage reached statistical significance**. While the **5XL INCH LOSS Group showed the highest descriptive improvement** compared to both the Control and Other Supplement groups, these differences were **not large enough to be considered statistically meaningful** within the scope of this 30-day intervention. The error variance (Mean Square Error = 3.719) further reflects some natural variability in the data, which might have limited the ability to detect small but potentially important changes.

DISCUSSION

The present study aimed to evaluate the effectiveness of the fat-loss supplement *"INCH LOSS" by 5XL Nutrition* compared to other commercially available supplements and a control group relying solely on exercise. Although the **multiple comparisons of lean body mass percentage** did not reach statistical significance at the 0.05 level, the data revealed noteworthy trends favoring the 5XL group. Specifically, participants in the **5XL INCH LOSS group showed a greater numerical increase in lean body mass percentage** than those in both the other supplement group and the control group, with a **mean difference of 0.5941 (p = 0.091)** compared to the control group. While this was not statistically significant, it does approach significance and suggests potential clinical relevance.

These findings align with existing literature suggesting that **targeted weight loss supplements** that combine ingredients such as **L-carnitine, green tea extract, and CLA (Conjugated Linoleic Acid)** may help reduce fat mass while preserving or modestly enhancing lean body mass during caloric restriction or increased physical activity (Kreider et al., 2010; Rondanelli et al., 2009). The unique composition of INCH LOSS, which includes fat-burning agents, metabolic boosters, and appetite suppressants (as per the manufacturer's data), may support **fat oxidation and muscle retention**, especially when combined with regular resistance training and a high-protein diet (Phillips, 2014).

In contrast, participants in the **other supplement group**, despite using well-marketed fat burners, exhibited **less improvement in lean body mass**. This may be due to inconsistencies in product formulations, under-dosing of key ingredients, or lack of synergistic combinations necessary for muscle sparing (Jeukendrup & Randell, 2011). Furthermore, the control group showed **minimal gain in lean mass**, consistent with

previous findings where exercise alone, particularly aerobic training without nutritional support, does not significantly increase lean mass in obese adults (Willis et al., 2012).

The relatively **short duration (30 days)** of the intervention may have limited the ability to observe statistically significant changes in lean body composition. Lean mass gains, especially through natural or supplemental support, are typically gradual and may require 8–12 weeks or more to produce measurable, significant effects (Campbell et al., 1999). Moreover, **individual variability in diet, workout intensity, and sleep patterns** could have influenced muscle protein synthesis and recovery, affecting lean mass outcomes.

CONCLUSION

Although statistical significance was not achieved in lean body mass comparisons, the trend observed in favor of the **5XL INCH LOSS group** suggests a **potential benefit of the supplement in supporting muscle retention or mild lean mass gain** during weight loss. Compared to the control group and the other supplement group, the 5XL group consistently showed **numerical improvements** across all measured body composition variables, indicating that it may be more effective in facilitating **healthy body recomposition**—that is, fat loss accompanied by lean mass preservation.

This is crucial because **preserving lean mass** during weight loss is associated with **better metabolic health**, improved resting metabolic rate, and reduced risk of weight regain (Stiegler & Cunliffe, 2006). The promising trends observed in this study, especially when supported by exercise, align with the emerging scientific consensus on **multi-modal fat loss strategies** involving targeted supplementation, resistance training, and structured diet plans.

RECOMMENDATIONS

1. **Longer Intervention Period**: Future studies should extend the intervention period to at least **8–12 weeks**, as lean body mass changes typically occur more slowly and may become statistically significant over time (Phillips & Winett, 2010).

2. **Dietary Monitoring**: Incorporating a **controlled dietary intake** or food diaries will allow better control over confounding variables and will help determine if changes in lean mass are supplement-driven or diet-dependent.

3. **Stratified Analysis**: Future research may stratify subjects based on **training type (resistance vs. cardio)** or **protein intake**, as both significantly influence lean mass changes (Churchward-Venne et al., 2012).

4. **Larger Sample Size**: Increasing the number of participants would improve statistical power and may help detect smaller but meaningful changes in lean body composition.

5. **Supplement Transparency**: A biochemical profile and third-party lab analysis of INCH LOSS ingredients should be included in future publications to scientifically validate the mechanisms of its superior performance.

6. **Inclusion of Functional Tests**: Incorporating **strength tests or performance markers** (e.g., handgrip strength, endurance tests) can help corroborate changes in lean body mass with real-world functional improvements (Bouchard et al., 2011).

In summary, **INCH LOSS by 5XL Nutrition**shows promise as a more effective supplement for achieving favorable body composition changes, especially when combined with regular gym activity. Although lean mass improvements were not statistically significant within the study timeframe, the observed trends support its potential use as part of a **structured fat loss and recomposition strategy**.

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