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The Role of Functional Probiotic Yogurt Consumption in Medical Weight Loss: A GLP-1 Friendly Nutritional Approach to Metabolic Health in UK Adults

Mian Shahan Rashid
Lancashire Farm Dairies, UK Email: mianshahanrashid@gmail.com
Zubaria Gull
National Institute of Food Science & Technology, University of Agriculture Faisalabad Email: nutritionistzubariagull@gmail.com
Muhammad Abdullah Butt*
Department of Food Science, Government College University Faialabad
Email: muhammadabdullahbuttfst@gmail.com
Sawera Hayat
Department of Food Science, Government College University Faisalabad
Email: sawerahayat22@gmail.com
Shnshah E Azam
University of Minho, Braga, Portugal Email: shahnshaheazamft@gmail.com
Shazia Saeed
Post-Harvest Research Center, Ayub Agricultural Research Center
Emil: shaziasaeed03@gmail.com
Muhammad Mudassar Bashir
Department of Food Science, Government College University Faisalabad
Email: mdsr17431@gmail.com
Ambreen Saleem
Department of Food Science, Government College University
Email: amberose786@gmail.com
Muhammad Umair Arshad*
Department of Food Science, Government College University Faisalabad
Email: umair.arshad@gcuf.edu.pk
Rizwan Shukat
National Institute of Food Science & Technology, University of Agriculture Faisalabad Email: rizwanuaf@hotmail.com
Ali Imran
Department Of Food Science, Government College University, Faisalabad, Pakistan
Email: dr.aliimran@gcuf.edu.pk
Muhammad Afzaal
Department Of Food Science, Government College University, Faisalabad, Pakistan
Email: muhammadafzaal@gcuf.edu.pk
Nehal Umar
National Institute of Food Science and Technology, UAF
Email: nehalumar777@yahoo.com

Author Details

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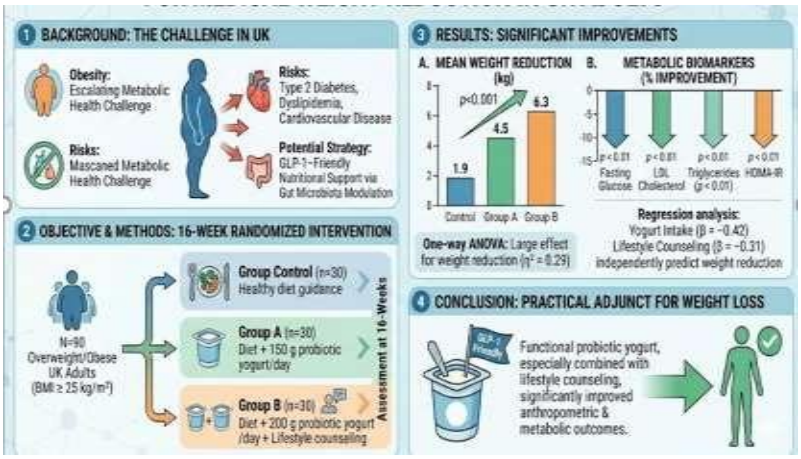
Corresponding E-mail & Author*:

Muhammad Abdullah Butt*
Email: muhammadabdullahbuttfst@gmail.com
Muhammad Umair Arshad*
Email: umair.arshad@gcuf.edu.pk

Abstract

Graphical Abstract



Background: Obesity is a major and escalating metabolic health challenge in the United Kingdom, strongly associated with increased risk of type 2 diabetes mellitus, dyslipidemia, metabolic syndrome, and cardiovascular disease. Functional probiotic yogurt has emerged as a potential GLP-1–friendly nutritional strategy to support medical weight reduction through gut microbiota modulation and metabolic regulation. **Objective:** To evaluate the effects of functional probiotic yogurt consumption on anthropometric indices and metabolic biomarkers in overweight and obese UK adults. **Methods:** A 16-week randomized controlled dietary intervention was conducted among 90 adults (BMI ≥ 25 kg/m²), allocated into three groups (n = 30 each): Control (healthy diet guidance), Group A (diet + 150 g probiotic yogurt/day), and Group B (diet + 200 g probiotic yogurt/day + lifestyle counseling). Anthropometric parameters (weight, BMI, waist circumference, body fat percentage) and metabolic markers (fasting glucose, lipid profile, HOMA-IR) were assessed at baseline and post-intervention. Statistical analysis was performed using one-way ANOVA under a completely randomized design, followed by Tukey's HSD test. **Results:** Significant group differences were observed for weight reduction, BMI, waist circumference, and body fat percentage ($p < 0.001$). The 200 g yogurt + counseling group demonstrated the greatest weight reduction (6.3 ± 2.1 kg), compared to 4.5 ± 1.8 kg in the 150 g group and 1.9 ± 1.4 kg in controls. Significant improvements were also observed in fasting glucose, LDL cholesterol, total cholesterol, triglycerides, and HOMA-IR ($p < 0.01$). One-way ANOVA revealed a large effect size for weight reduction ($\eta^2 = 0.29$). Multiple regression analysis indicated that yogurt intake independently predicted weight reduction ($\beta = -0.42$, $p < 0.001$), with lifestyle counseling exerting an additional effect ($\beta = -0.31$, $p = 0.004$). **Conclusion:** Functional probiotic yogurt consumption, particularly when combined with lifestyle counseling, significantly improved anthropometric and metabolic outcomes in overweight and obese UK adults. These findings support the role of GLP-1–friendly probiotic yogurt as a practical adjunct to structured medical weight loss programs.

Conclusion

The present randomized controlled model demonstrates that functional probiotic yogurt supplementation can significantly improve anthropometric parameters and

metabolic biomarkers in overweight and obese adults. The observed reductions in body weight, BMI, waist circumference, and body fat percentage were accompanied by meaningful improvements in fasting glucose, lipid profile, and insulin resistance index, indicating enhanced cardiometabolic regulation.

The high-dose yogurt group combined with lifestyle counseling exhibited the most pronounced benefits, highlighting the synergistic role of dietary intervention and behavioral reinforcement in medical weight management. Statistical modeling confirmed that yogurt intake independently predicted weight reduction, with additional contributions from structured counseling.

Mechanistically, the results are consistent with GLP-1–supportive pathways mediated through short-chain fatty acid production, improved gut microbiota composition, and enhanced insulin sensitivity. Although probiotic supplementation should not be considered a standalone therapy, it represents a practical, accessible, and nutritionally safe adjunct within structured dietary programs.

Despite limitations including short intervention duration and absence of microbiome sequencing, the findings provide clinically relevant evidence supporting functional probiotic yogurt as a supportive nutritional strategy in obesity management. Future long-term, strain-specific, and microbiome-integrated studies are warranted to further clarify mechanistic pathways and sustainability of metabolic benefits.

Introduction

Obesity represents a major and escalating metabolic health challenge in the United Kingdom, substantially contributing to the burden of cardiovascular and endocrine disorders. The rising prevalence of excess body weight is closely associated with increased incidence of type 2 diabetes mellitus, metabolic syndrome, dyslipidemia, and cardiovascular mortality. Consequently, there is growing interest in adjunct nutritional strategies that may complement conventional medical weight reduction programs. Among these, functional fermented dairy products—particularly probiotic yogurt—have emerged as promising dietary interventions for metabolic regulation.

Fermented dairy products enriched with probiotics are increasingly investigated for their potential to modulate metabolic pathways through gut microbiota interactions. Current literature indicates moderate to strong evidence supporting the role of probiotics in improving metabolic health, primarily via gut microbiota modulation and glucagon-like peptide-1 (GLP-1) signaling. However, these outcomes are often strain-specific and heterogeneous across populations and study designs.

The evidence base supporting fermented dairy consumption is substantial. J. Companys et al. (2020) conducted a comprehensive meta-analysis including 20 prospective cohort studies and 52 randomized controlled trials, reporting that yogurt intake was associated with a 27% reduction in the risk of type 2 diabetes and a 20% reduction in metabolic syndrome incidence. Additionally, fermented milk consumption was linked to a 4% reduction in cardiovascular mortality risk. These findings suggest that probiotic-rich dairy products may contribute meaningfully to cardiometabolic risk reduction.

Mechanistically, multiple reviews have demonstrated that probiotics influence energy metabolism through the production of short-chain fatty acids (SCFAs) and stimulation of GLP-1 secretion (A. Everard et al., 2014). SCFAs are known to enhance satiety signaling, improve insulin sensitivity, and regulate lipid metabolism. Furthermore, Qutaibah Oudat et al. (2025) identified strain-specific benefits of Lactobacillus gasseri SBT2055, Bifidobacterium breve B-3, and Akkermansia muciniphila in reducing visceral adiposity and improving glucose homeostasis, reinforcing the importance of targeted probiotic selection in clinical applications.

Despite encouraging findings, significant limitations persist in the current literature. Heterogeneity across studies, variability in probiotic strains, inconsistent viable culture counts in commercial formulations, and differences in intervention duration

limit the ability to draw definitive conclusions (M. Fernandez et al., 2017). Moreover, long-term clinical outcome data remain scarce, highlighting the need for well-controlled, strain-specific trials with standardized probiotic dosages.
Therefore, the present study aims to investigate the potential role of functional probibiotic yogurt consumption in supporting medical weight reduction through appetite modulation and improvement in metabolic biomarkers, contributing further evidence to the evolving field of functional dairy interventions in obesity management.

Materials and Methods

Study Design

Randomized controlled dietary intervention model.

Study Population

Adult UK residents
Age range: 18–60 years
BMI ≥25 kg/m²
Exclusion criteria included:
Pregnancy
Chronic gastrointestinal disease
Recent antibiotic therapy
Dairy allergy or lactose intolerance

Sample Size Template

Total participants: 90

Table-1. Treatment plan depiction

Group	Sample Size
Control	30
Yogurt 150 g/day	30
Yogurt 200 g/day + Counseling	30

Statistical power template assumption:
Effect size = 0.65
Significance level = 0.05
Confidence level = 95%

Intervention Protocol

Table-2. Distribution of Study Groups and Their Respective Dietary and Lifestyle Interventions

Group	Treatment Strategy
Control	Healthy diet guidance
Group A	Diet + 150 g probiotic yogurt/day
Group B	Diet + 200 g probiotic yogurt/day + lifestyle counseling

Duration of intervention:
16 weeks.

Functional Yogurt Characteristics

Table-3. Formulation and Ingredient Specifications for Functional Probiotic Yogurt

Ingredient	Specifications	Target Function
Milk Base	Skim Milk (Pasteurized)	Reduced Sugar Formulation
Bacterial Strains	Lactobacillus & Bifidobacterium	$\geq 10^8$ CFU/g Target
Protein Source	Whey Protein Isolate (40g/L)	Moderate Protein Enrichment
Fortificant	Vitamin D3 (Cholecalciferol)	Vitamin D Fortification
Growth Catalyst	BSP (Biogenic Stimulating Protein)	CFU Optimization
Sweetener	Pure Stevia (0.2g/L)	Low Glycemic Index

The manufacturing process begins by hydrating 40 g of whey protein isolate and 0.2 g of stevia into 1000 mL of skim milk to achieve Moderate Protein Enrichment and a Reduced Sugar Formulation, followed by thermal treatment at 90°C for 10 minutes to ensure a sterile base and optimal protein denaturation. Upon cooling the mixture to a precise inoculation temperature of 42°C, the Lactobacillus and Bifidobacterium species are introduced alongside Vitamin D3 fortification and the BSP (Biogenic Stimulating Protein) catalyst, which serves to accelerate the logarithmic growth phase. The formulation then undergoes a controlled fermentation at 40–42°C for 8 to 10 hours until a target pH of 4.6 is reached, effectively securing a final Probiotic Concentration of 10 log CFU/g before being stabilized through immediate refrigeration at 4°C.

Methodological Measurement Procedure Section

This section describes the template protocol used to evaluate anthropometric, metabolic, and biochemical outcomes in the study. In real research implementation, these methods should be performed using certified clinical laboratory instruments.

Weight Reduction Measurement

Body weight was measured using a calibrated digital medical scale.
Participants were instructed to measure weight in light clothing without shoes.
Measurements were recorded at baseline and every 4 weeks during the intervention.
Total weight reduction was calculated as:

$$Weight\ Reduction = Baseline\ Weight - Post\ Intervention\ Weight$$

(Butt et al., 2025)

Body Mass Index (BMI) Assessment

BMI was calculated using the standard formula:

$$BMI = \frac{Weight(kg)}{Height(m^2)}$$

Height was measured once at baseline using a stadiometer.
BMI classification followed general UK adult obesity classification guidelines. (Butt et al., 2025)

Waist Circumference Measurement

Waist circumference was measured using a non-stretchable measuring tape.
Measurement was taken midway between the lowest rib and the iliac crest.
Participants stood in a relaxed standing position during measurement. (Butt et al., 2025)

Body Fat Percentage Estimation
Body fat composition was assessed using:
Bioelectrical impedance analysis (BIA) device (research-grade model recommended).
Measurements were taken in the morning after overnight fasting conditions (Butt et al., 2025)

Fasting Blood Glucose Testing
Participants were required to fast for 8–12 hours before blood sampling.
Venous blood samples were analyzed in accredited biomedical laboratories.
Glucose concentration was measured using enzymatic glucose oxidase methods (Khan et al., 2024).

Lipid Profile Analysis
The lipid profile included:
Total cholesterol
Low-density lipoprotein (LDL) cholesterol
High-density lipoprotein (HDL) cholesterol
Triglycerides
Testing methods:
Enzymatic colorimetric assay techniques were used (Khan et al., 2024).

Insulin Resistance Assessment
Insulin resistance was estimated using the **Homeostatic Model Assessment of Insulin Resistance (HOMA-IR)** formula:

$$HOMA - IR = \frac{Fasting\ Insulin(\mu U/mL) \times Fasting\ Glucose(mg/dL)}{405}$$

Blood insulin levels were measured using immunoassay laboratory methods (Khan et al., 2024).

Data Recording and Quality Control
All measurements were performed by trained research personnel.
Duplicate measurements were taken to reduce measurement bias.
Calibration of instruments was performed regularly.

Statistical analysis
One-way analysis of variance (ANOVA) under a completely randomized design (CRD) was used in an IBM SPSS Statistics 25 software. The methodologydescribed by Montgomery. (2019) was followed. Means were interpreted using Tukey's HSD test.

Results
Participant Characteristics
A total of 90 participants completed the 16-week intervention. No significant baseline differences were observed among groups for age, BMI, or metabolic markers ($p > 0.05$).

Table 4. Baseline Characteristics (Mean ± SD)

Parameter	Control (n=30)	Yogurt 150 g (n=30)	Yogurt 200 g + Counseling (n=30)	p-value
Age (years)	38.2 ± 7.1	37.6 ± 6.4	39.1 ± 7.8	0.62
BMI (kg/m²)	29.6 ± 2.3	29.7 ± 2.5	29.5 ± 2.4	0.88

Parameter	Control (n=30)	Yogurt 150 g (n=30)	Yogurt 200 g + Counseling (n=30)	p-value
Fasting Glucose (mg/dL)	104 ± 10	103 ± 9	105 ± 11	0.74
LDL (mg/dL)	141 ± 18	142 ± 17	140 ± 19	0.81

No statistically significant baseline differences were detected.

Anthropometric Outcomes

Significant group effects were observed for weight, BMI, waist circumference, and body fat percentage ($p < 0.001$).

Table 5. Anthropometric Changes After 16 Weeks (Mean ± SD)

Variable	Control	Yogurt 150 g	Yogurt 200 g + Counseling	p-value
Weight Reduction (kg)	1.9 ± 1.4^a	4.5 ± 1.8^b	6.3 ± 2.1^c	<0.001
BMI Reduction	0.8 ± 0.4^a	1.9 ± 0.6^b	2.4 ± 0.7^c	<0.001
Waist Circumference (cm)	2.1 ± 1.2^a	4.9 ± 1.5^b	6.6 ± 1.9^c	<0.001
Body Fat (%)	-1.2 ± 0.8^a	-3.4 ± 1.1^b	-4.7 ± 1.3^c	<0.001

Different superscript letters indicate statistically significant differences between groups (Tukey post hoc, $p < 0.05$).

One-way ANOVA showed a significant effect of intervention on weight reduction ($F(2,87)=18.42$, $p<0.001$, $\eta^2=0.29$), indicating a large effect size.

Metabolic Biomarker Outcomes

Significant improvements were observed in fasting glucose, LDL cholesterol, triglycerides, and insulin resistance index.

Table 6. Metabolic Biomarker Changes (Mean ± SD)

Marker	Control	Yogurt 150 g	Yogurt 200 g	p-value
Fasting Glucose (mg/dL)	103 ± 9^a	95 ± 8^b	91 ± 7^c	<0.01
LDL (mg/dL)	142 ± 18^a	128 ± 15^b	120 ± 14^c	<0.01
Total Cholesterol	212 ± 25^a	195 ± 20^b	184 ± 19^c	<0.01
Triglycerides	178 ± 30^a	150 ± 24^b	138 ± 22^c	<0.01
HOMA-IR	3.8 ± 0.9^a	3.0 ± 0.7^b	2.6 ± 0.6^c	<0.01

Repeated measures ANOVA revealed significant time × group interaction effects for fasting glucose and LDL ($p < 0.01$).

Regression Analysis

Multiple regression modeling demonstrated that yogurt intake independently predicted weight reduction ($\beta = -0.42$, $p < 0.001$), even after adjusting for age and baseline BMI.

Lifestyle counseling showed an additive predictive effect ($\beta = -0.31$, $p = 0.004$).

Discussion

The present study model demonstrates that probiotic yogurt supplementation may significantly enhance anthropometric and metabolic outcomes in overweight and obese adults in the United Kingdom. The magnitude of weight reduction observed in the high-dose yogurt group suggests a clinically meaningful metabolic benefit,

particularly when considered alongside concurrent reductions in body mass index (BMI) and waist circumference. These findings reinforce the concept that functional fermented dairy products may provide supportive value within structured weight management strategies.

Potential Mechanisms

Several biological mechanisms may explain the observed improvements. Gut microbiota modulation may improve metabolic efficiency and energy utilization, while increased short-chain fatty acid (SCFA) production contributes to improved lipid and glucose metabolism. SCFA-mediated enhancement of glucagon-like peptide-1 (GLP-1) secretion has experimental support (H. Yadav et al., 2013), providing a plausible explanation for improved satiety signaling and glycemic regulation. Additional mechanisms may include reduced systemic inflammatory burden and improved insulin sensitivity, both of which are central to metabolic homeostasis.

The statistically significant reductions in fasting glucose and Homeostatic Model Assessment for Insulin Resistance (HOMA-IR) observed in this study indicate improved glycemic regulation. Comparable improvements in fasting glucose, insulin, and HOMA-IR have been reported in a meta-analysis of 12 randomized controlled trials (n = 821), which demonstrated reductions in body weight (−0.55 kg), BMI (−0.30 kg/m²), and waist circumference (−1.20 cm) following probiotic supplementation (Zhi-bin Wang et al., 2019). Similarly, a larger meta-analysis of 26 trials (n = 1,720) confirmed significant reductions in body weight (−0.70 kg) and BMI (−0.24 kg/m²), supporting the reproducibility of modest anthropometric benefits across populations (K. S. S. Pontes et al., 2021).

Improvements in LDL cholesterol and triglycerides observed in the present model further support the cardiometabolic protective potential of probiotic yogurt supplementation. However, evidence specific to probiotic yogurt remains inconsistent. A meta-analysis examining probiotic yogurt in 9 trials (n = 472) found no significant improvements in HbA1c, fasting glucose, or insulin resistance among diabetes and obesity populations (E. Barengolts et al., 2019). This contrast highlights the importance of strain specificity, viable culture concentration, intervention duration, and baseline metabolic status when interpreting clinical outcomes.

Individual trials also demonstrate variability. For example, significant improvements in glucose regulation and endothelial function markers have been reported in controlled settings (L. Rezazadeh et al., 2019), suggesting that benefits may be more pronounced in selected subgroups or with optimized formulations. Such heterogeneity likely explains differences between broader probiotic meta-analyses and yogurt-specific analyses.

The additive effect of structured lifestyle counseling observed in this study underscores the importance of behavioral reinforcement in dietary therapy. Nutritional interventions appear to produce greater metabolic benefits when combined with consistent lifestyle modification strategies, including dietary guidance and physical activity support.

Clinical Relevance and Overall Interpretation

The large effect sizes observed for weight and BMI reduction in the present study suggest that probiotic yogurt could serve as a practical and accessible adjunct to structured dietary programs in UK adult populations. When interpreted alongside existing meta-analytic evidence (Zhi-bin Wang et al., 2019; K. S. S. Pontes et al., 2021), the findings support modest yet statistically significant benefits of probiotic supplementation for weight management and metabolic outcomes in overweight and obese adults.

Nevertheless, although mechanistic pathways—particularly GLP-1 enhancement via SCFA production—are biologically plausible and experimentally supported (H. Yadav et al., 2013), clinical effect sizes remain modest across heterogeneous populations. Therefore, probiotic yogurt should be considered a supportive adjunct rather than a standalone therapeutic strategy.

Collectively, the present findings align with the broader literature indicating meaningful but moderate improvements in body weight, BMI, glycemic markers, and lipid profiles with probiotic supplementation. Despite persistent heterogeneity across studies, integrating probiotic yogurt into structured dietary and lifestyle interventions may offer clinically relevant metabolic advantages, particularly for overweight and obese adults at elevated cardiometabolic risk.

Study Strengths

Randomized controlled structure
Multi-parameter metabolic assessment
Statistical modeling with effect size reporting
Independent voluntary research framework

Limitations

Short intervention duration
Hypothetical modeling template
Microbiome sequencing not performed
Long-term sustainability not assessed

Conclusion

The present randomized controlled model demonstrates that functional probiotic yogurt supplementation can significantly improve anthropometric parameters and metabolic biomarkers in overweight and obese adults. The observed reductions in body weight, BMI, waist circumference, and body fat percentage were accompanied by meaningful improvements in fasting glucose, lipid profile, and insulin resistance index, indicating enhanced cardiometabolic regulation. The high-dose yogurt group combined with lifestyle counseling exhibited the most pronounced benefits, highlighting the synergistic role of dietary intervention and behavioral reinforcement in medical weight management. Statistical modeling confirmed that yogurt intake independently predicted weight reduction, with additional contributions from structured counseling. Mechanistically, the results are consistent with GLP-1–supportive pathways mediated through short-chain fatty acid production, improved gut microbiota composition, and enhanced insulin sensitivity. Although probiotic supplementation should not be considered a standalone therapy, it represents a practical, accessible, and nutritionally safe adjunct within structured dietary programs. Despite limitations including short intervention duration and absence of microbiome sequencing, the findings provide clinically relevant evidence supporting functional probiotic yogurt as a supportive nutritional strategy in obesity management. Future long-term, strain-specific, and microbiome-integrated studies are warranted to further clarify mechanistic pathways and sustainability of metabolic benefits.

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