Original Article

Effect of Regular Physical Activity (Zumba) on Central Obesity Markers (BMI, Waist Circumference and Waist–Hip Ratio) Among Females Aged 18–40 Years

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Abstract

Background: Central obesity is a major risk factor for cardiometabolic disorders including metabolic syndrome, type 2 diabetes, hypertension, and coronary artery disease. Regular physical activity plays a crucial role in reducing abdominal adiposity. Zumba, a dance-based aerobic exercise, is increasingly popular among women, but limited prospective data exist on its effect on central obesity markers.

Aim: To assess the effect of regular Zumba exercise on BMI, waist circumference (WC), and waist–hip ratio (WHR) among females aged 18–40 years.

Methods: A Quasi experimental study was conducted among 100 females aged 18–40 years in Guwahati. Participants underwent supervised Zumba sessions (60 minutes, 3 days/week) for 12 weeks. Anthropometric parameters (BMI, WC, WHR) were measured at baseline and post-intervention. Paired t-test was used to compare pre- and post-intervention values. A p-value < 0.05 was considered statistically significant.

Results: Significant reductions were observed after 12 weeks of Zumba. BMI decreased from 27.24 ± 2.27 kg/m² to 25.49 ± 2.39 kg/m² ($p < 0.001$). Waist circumference reduced from 88.13 ± 5.72 cm to 82.25 ± 5.71 cm ($p < 0.001$). WHR decreased from 0.89 ± 0.04 to 0.85 ± 0.05 ($p < 0.001$).

Conclusion: Regular Zumba exercise significantly reduces central obesity markers and may serve as an effective, enjoyable, and sustainable strategy for obesity management among young and middle-aged women.

Keywords: Zumba; Central obesity; Body Mass Index; Waist circumference; Waist–Hip Ratio; Physical activity; Women; Prospective study

Introduction

Central obesity is a major public health concern and a well-established risk factor for cardiometabolic disorders such as metabolic syndrome, type 2

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diabetes mellitus, hypertension, and coronary artery disease[1,2]. Accumulation of abdominal fat, particularly visceral adiposity, is strongly associated with insulin resistance, dyslipidemia, and systemic inflammation[2]. Anthropometric indicators such as Body Mass Index (BMI), Waist Circumference (WC), and Waist–Hip Ratio (WHR) are widely used, simple, and reliable markers for assessing general and central obesity[1,13].

Regular physical activity plays a pivotal role in preventing and reducing obesity by increasing energy expenditure, improving metabolic efficiency, and enhancing fat oxidation[4,12]. Aerobic exercises have been shown to reduce visceral fat and improve body composition[14,15]. Zumba, a dance-based aerobic fitness program combining Latin and international music with dynamic movements, has gained popularity due to its enjoyable format and high adherence rates, especially among women. It provides moderate-to-high intensity cardiovascular exercise and may contribute to reduction in central adiposity[8,11].

Although several studies have examined the benefits of aerobic exercise on weight reduction, limited prospective data are available regarding the specific impact of structured Zumba training on central obesity markers among young and middle-aged women. Therefore, the present study was undertaken to evaluate the effect of regular Zumba exercise on BMI, waist circumference, and waist–hip ratio among females aged 18–40 years.

Materials and Methods

Study Design

A quasi experimental single group pre and post study.

Study Setting

The study was conducted at selected Zumba centers in Guwahati city, Assam, India.

Study Duration

12 weeks (intervention period).

Study Population

A total of 100 females aged 18–40 years were recruited using a convenience sampling technique from selected Zumba centres in Guwahati city.

Participants were enrolled voluntarily after being informed about the study. Initial screening was carried out through a structured questionnaire followed by clinical assessment.

Intervention Protocol

Participants attended supervised Zumba sessions conducted by a certified Zumba instructor.

- Frequency: 3 sessions per week
- Duration: 60 minutes per session
- Total intervention period: 12 weeks

Each session included warm-up, high-intensity dance movements, and cool-down exercises.

All participants were screened for the presence of comorbidities through:

- Detailed medical history
- Physical examination
- Basic clinical parameters (e.g., blood pressure assessment)

Participants with known metabolic, cardiovascular, musculoskeletal, or endocrine disorders (such as diabetes mellitus, hypertension, thyroid disorders) were excluded. Thus, only apparently healthy individuals were included in the study to ensure homogeneity.

Power Analysis

A priori power analysis was estimated based on expected changes in BMI following aerobic exercise interventions reported in previous studies. Assuming a moderate-to-large effect size (Cohen's $d \approx 0.7$), an alpha level of 0.05, and statistical power of 80%, the minimum required sample size for a paired t-test was calculated to be approximately 19–25 participants.

The present study included 100 participants, which substantially exceeds the minimum required sample size, thereby ensuring adequate statistical power to detect significant differences in anthropometric parameters.

Data Collection

Anthropometric measurements were recorded at baseline (pre-intervention) and after completion of 12 weeks (post-intervention).

Measurements

1. Body Weight:

Measured using a calibrated digital weighing scale with participants in minimal clothing and barefoot.

2. Height:

Measured using a stadiometer. BMI was calculated as weight (kg) divided by height (m^2).

3. Waist Circumference (WC):

Measured using a non-stretchable measuring tape at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest at the end of normal expiration.

4. Hip Circumference:

Measured at the widest portion of the buttocks using a flexible measuring tape.

5. Waist–Hip Ratio (WHR):

Calculated as waist circumference divided by hip circumference.

Statistical Analysis

Data were analyzed using SPSS software (version to be specified). Results were expressed as mean ± standard deviation (SD). Paired t-test was used to compare pre- and post-intervention values. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Institutional Ethics Committee of Gauhati Medical College & Hospital, Guwahati, Assam, India, with approval reference number IEC/GMCH/2024/092 dated 15 September 2024. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all participants prior to enrollment.

Inclusion Criteria

- Females aged 18–40 years
- Willing to participate in regular Zumba sessions for 12 weeks
- Apparently healthy individuals without diagnosed metabolic or cardiovascular disorders
- Provided written informed consent

Exclusion Criteria

- Pregnant women
- Individuals on weight-loss medications
- Participants with known cardiovascular, musculoskeletal, or metabolic disorders
- Individuals with recent injuries or chronic illness limiting physical activity
- Participants who missed more than 20% of scheduled Zumba sessions

Access to Research subjects

The researchers accessed participants through collaboration with selected Zumba fitness centres in Guwahati. Permission was obtained from the centre authorities prior to recruitment. Participants attending these centres were approached, informed about the study objectives, and invited to participate voluntarily.

Results

Significant reductions were observed in all central obesity markers following 12 weeks of Zumba training.

- BMI: 27.24 ± 2.27 → 25.49 ± 2.39 kg/m^2 ($p < 0.001$)
- Waist Circumference: 88.13 ± 5.72 → 82.25 ± 5.71 cm ($p < 0.001$)
- WHR: 0.89 ± 0.04 → 0.85 ± 0.05 ($p < 0.001$)

These findings indicate a statistically significant improvement in both general and abdominal adiposity.

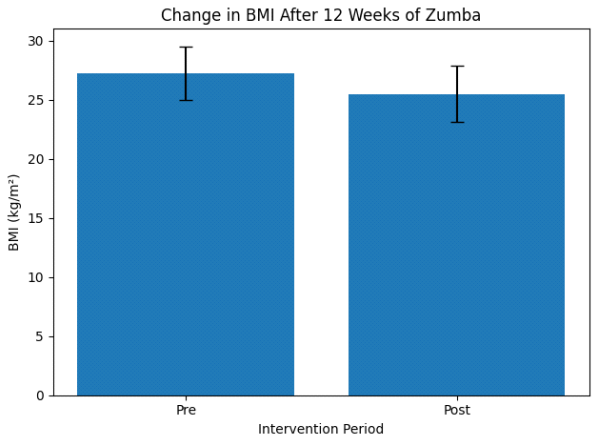

Figure 1: Significant reduction in BMI following 12 weeks of Zumba intervention ($p < 0.001$).

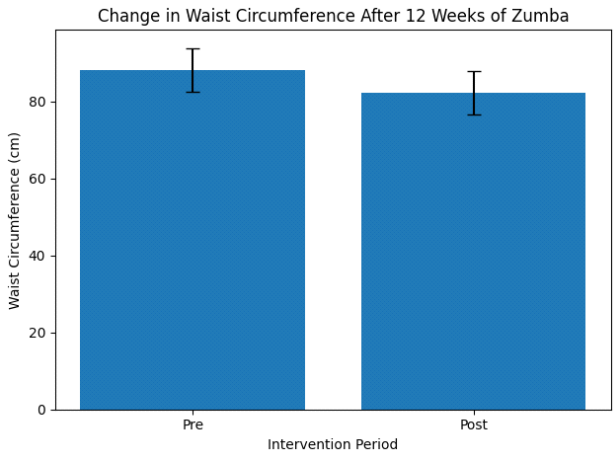

Figure 2: Significant reduction in waist circumference after intervention ($p < 0.001$).

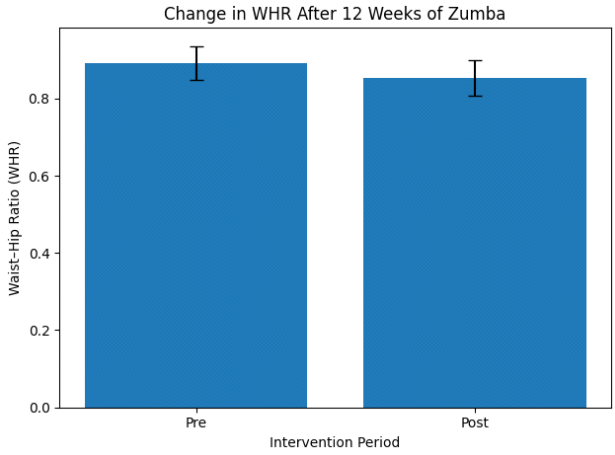

Figure 3: Significant reduction in waist–hip ratio after intervention ($p < 0.001$).

Discussion

The present quasi-experimental study demonstrates that a structured 12-week Zumba intervention results in significant reductions in BMI, waist circumference, and waist–hip ratio among females aged 18–40 years. The magnitude of reduction observed across all anthropometric parameters suggests a meaningful improvement in both general and central adiposity.

The observed findings are consistent with existing literature indicating that aerobic exercise plays a critical role in reducing body fat and improving metabolic health. Previous studies by Swift et al. (2014) and Donnelly et al. (2009) have shown that structured aerobic interventions lead to significant reductions in body weight and adiposity[4,5]. Similarly, Ross and Janssen (2001) demonstrated that physical activity is effective in reducing both total and visceral fat[3], while Després (2012) emphasized the strong association between central fat reduction and decreased cardiometabolic risk[2]. Additional evidence from systematic reviews and meta-analyses further supports the role of both moderate-intensity and interval-based aerobic exercise in reducing adiposity[6,7]. The present study extends this body of evidence by specifically evaluating a dance-based aerobic modality within a young female population.

The significant reduction in waist circumference and waist–hip ratio is of particular clinical relevance, as central obesity is more strongly associated with insulin resistance, dyslipidemia, and systemic inflammation than generalized obesity[2,13]. Zumba incorporates intermittent moderate-to-high intensity movements within a rhythmic aerobic framework, which may enhance caloric expenditure and promote preferential mobilization of visceral fat[14,15]. Furthermore, previous interventional studies on Zumba have demonstrated improvements in body composition, cardiovascular fitness, and metabolic health among women[8–11]. In addition, its group-based and music-driven format may improve adherence and consistency, potentially contributing to the observed outcomes beyond the physiological effects of exercise alone.

Despite these promising findings, several methodological limitations must be considered. The absence of a control group limits the ability to attribute observed changes solely to the intervention, as unmeasured factors such as dietary habits, lifestyle modifications, or increased health awareness may have contributed to the results. The use of convenience sampling further restricts the generalizability of findings, and the relatively short duration of the intervention precludes assessment of long-term sustainability. Moreover, the reliance on anthropometric measures without inclusion of biochemical parameters (e.g., lipid profile, fasting glucose, inflammatory markers) limits insight into the underlying metabolic mechanisms.

Another important consideration is the lack of direct comparison with other forms of aerobic or resistance exercise. While Zumba appears effective, it remains unclear whether it offers

distinct physiological advantages beyond improved adherence and participant engagement. Future studies should therefore incorporate comparative designs to evaluate its relative efficacy.

Future research should prioritize randomized controlled trials with larger and more diverse populations, standardized dietary monitoring, and longer follow-up periods. Inclusion of metabolic, hormonal, and inflammatory biomarkers would provide a more comprehensive understanding of the mechanisms underlying the observed changes. Additionally, assessment of psychological outcomes, adherence rates, and quality of life would further clarify the broader benefits of Zumba as a public health intervention.

Conclusion

This quasi-experimental study demonstrates that a structured 12-week Zumba-based aerobic exercise program is associated with significant reductions in body mass index, waist circumference, and waist–hip ratio among females aged 18–40 years. These findings support the potential role of Zumba as an effective, accessible, and engaging non-pharmacological intervention for reducing central obesity and related cardiometabolic risk.

However, the findings should be interpreted with caution due to important methodological limitations, including the absence of a control group, lack of dietary monitoring, short intervention duration, and reliance solely on anthropometric measures without biochemical validation. These factors limit causal inference and mechanistic interpretation.

Future research should focus on randomized controlled trials with longer follow-up, inclusion of metabolic and inflammatory biomarkers, and comparative evaluation with other exercise modalities to better define the specific advantages and clinical utility of Zumba.

Overall, Zumba may represent a promising community-based strategy for obesity management, particularly among women, provided that its effectiveness is further validated through more rigorous study designs.

Limitations

- Lack of control group
- Lack of follow-up
- Short duration of intervention
- Absence of biochemical parameters (lipid profile, glucose levels)
- Use of convenience sampling limiting generalizability
- Limited external validity

Future Recommendations

- Conduct randomized controlled trials with larger sample sizes
- Include long-term follow-up to assess sustainability
- Incorporate biochemical and metabolic parameters
- Compare Zumba with other exercise modalities
- Evaluate psychological and quality-of-life outcomes
- Monitor dietary and lifestyle factors

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