

# The impact of aerobic exercise in alleviating physical disorders among premenopausal women

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## ABSTRACT

Premenopause is a transitional phase marked by hormonal fluctuations that often trigger physical discomfort. This study aimed to determine the effectiveness of aerobic exercise in reducing somatic symptoms among premenopausal women. A quasi-experimental pre-test-post-test control group design was conducted involving 58 women aged 40–55 years, selected through simple random sampling. The intervention group received aerobic exercise three times per week for eight weeks, while the control group received no intervention. Physical symptoms were assessed using the somatic domain of the Menopause Rating Scale (MRS). Results showed a significantly greater reduction in somatic scores in the intervention group compared to the control group (mean difference  $-4.6$  vs.  $-0.5$ ;  $p < 0.001$ ). Aerobic exercise demonstrated a large effect in alleviating hot flashes, joint and muscle pain, sleep disturbances, and cardiovascular-related complaints. In conclusion, aerobic exercise is an effective non-pharmacological strategy for reducing somatic symptoms during the premenopausal transition.

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## INTRODUCTION

Premenopause is a natural transition phase in women's reproductive life characterized by significant hormonal changes before entering menopause. This phase generally begins at age 40–45 years and can last for 2–8 years before complete menopause occurs (Ley, D., & Saha, 2025; Wasley & Gailey, 2024). During this period, women's bodies experience gradual decrease in production of estrogen and progesterone hormones, resulting in various physical and psychological symptoms that can interfere with daily quality of life (Li et al., 2025).

Data from Indonesian Ministry of Health show that approximately 40.2% of Indonesian women aged 40–55 years experience moderate to severe premenopause symptoms. Common symptoms include hot flashes (71.3%), sleep disorders (68.7%), chronic fatigue (65.2%), mood changes (62.4%), and joint and muscle pain (59.8%) (RI, 2022). Epidemiological studies estimate that number of women entering premenopause phase in Indonesia reaches approximately 7.4

million people, and this number is predicted to increase to 11.5 million in 2030 along with increase in life expectancy of Indonesian women (Fruitasari, 2024).

At the local level, the burden of premenopausal symptoms is substantial. In Pati Regency, Central Java, Health Office data recorded that there are approximately 27,850 women aged 40-55 years identified entering premenopause phase. In Tondomulyo Village, based on Community Health Center data, there are 213 women aged 40-55 years, and 76% of them report experiencing various premenopause symptoms. This becomes serious concern considering its impact on productivity and quality of life of women at productive age (Fruitasari, 2024).

Preliminary study results conducted in January 2025 on 15 premenopausal women in Tondomulyo Village revealed significant physical symptoms in respondents. Data showed that hot flashes were experienced by 85.3% respondents with average frequency of 6.7 times per day. Sleep disorders were also common complaint, reported by 78.6% respondents, including difficulty initiating sleep (45.2%), waking up in middle of night (65.8%), and waking up too early (38.4%), with average sleep duration of only 4.7 hours per night. In addition, joint and muscle pain were experienced by 72.4% respondents, especially in knee area (58.3%), waist (51.6%), and shoulder (42.7%).

Management of premenopause symptoms generally involves pharmacological and non-pharmacological approaches (Flores et al., 2021). Hormone Replacement Therapy (HRT) has long been primary choice in pharmacological management, but several studies indicate potential risks of side effects such as increased risk of stroke, heart disease, and breast cancer with long-term use (Flores et al., 2021; Manson et al., 2020; Mehta et al., 2021). This causes increasing interest in non-pharmacological approaches, including lifestyle modification and physical activity (Dąbrowska-Galas et al., 2021; Tran et al., 2021). Non-pharmacological approaches, including aerobic exercise, have gained increasing attention as alternatives to hormone therapy due to their safety profile and multiple physiological benefits. Aerobic exercise has been shown to improve thermoregulatory stability, increase endorphin production, enhance cardiovascular capacity, and support better sleep regulation (Carpeggiani Weber et al., 2025; Liu et al., 2022; Qian et al., 2023).

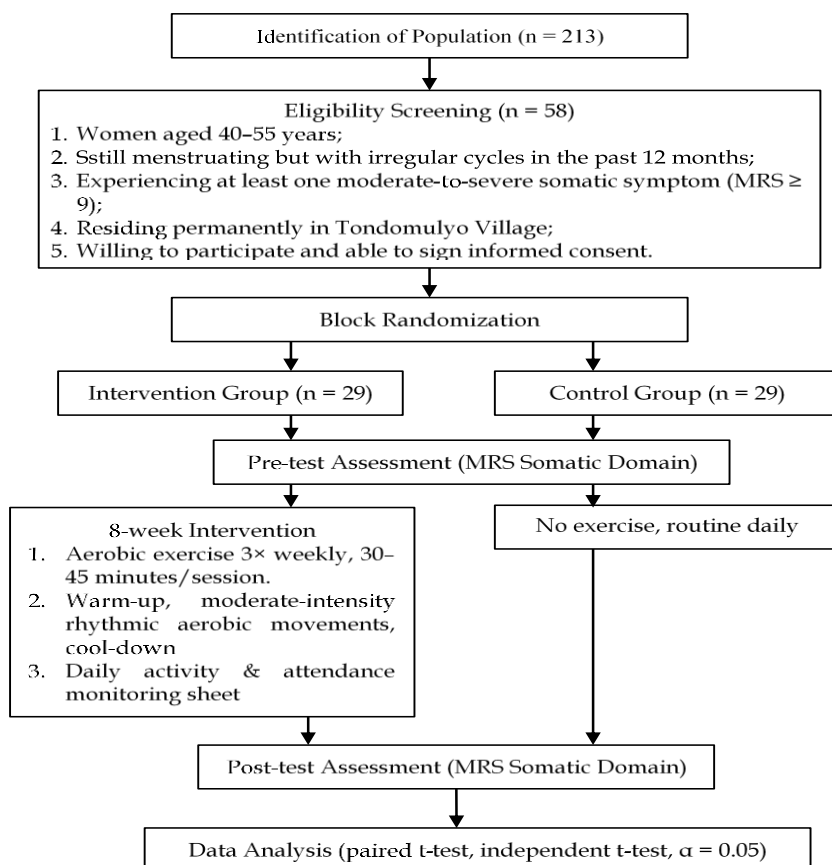
Aerobic exercise as one form of physical exercise has shown promising results in reducing premenopause symptoms (H. Xu et al., 2024). A meta-analysis published in *Journal of Women's Health* reported that moderate-intensity aerobic activity performed regularly (3-5 times per week for minimum 30 minutes) can reduce hot flashes frequency by up to 58% and improve sleep quality by up to 42% in premenopausal women (Liu et al., 2022). Other studies have also demonstrated that aerobic exercise increases endorphin levels, improves cardiovascular parameters, and positively affects bone density and sleep quality (Carpeggiani Weber et al., 2025; Qian et al., 2023; Wasley & Gailey, 2024).

The specific knowledge gaps identified in previous research are: the limited number of studies focusing specifically on premenopausal women; the scarcity of investigations conducted in rural areas—where socioeconomic conditions, daily workload, and access to exercise facilities differ markedly from urban settings; the lack of studies evaluating aerobic exercise using a validated instrument such as the MRS somatic domain; and the complete absence of research assessing these factors within the sociocultural context of Tondomulyo Village. These gaps highlight the need for research that not only evaluates the physiological benefits of aerobic exercise but also assesses its feasibility and effectiveness within rural communities. Therefore, this study aims to operationally determine the effectiveness of an eight-week structured aerobic exercise program, performed three times per week, in reducing somatic symptoms measured by the Menopause Rating Scale (MRS) among premenopausal women in Tondomulyo Village.

## RESEARCH METHOD

The study employed a quasi-experimental pre-test-post-test control group design to evaluate the effectiveness of aerobic exercise on somatic symptoms among premenopausal women. A simple

random sampling technique was used to ensure that all eligible women had equal opportunity for selection, and block randomization with a computerized random number generator was applied to assign participants evenly into intervention and control groups. The sample consisted of 58 premenopausal women aged 40–55 years who met the inclusion and exclusion criteria.



**Figure 1.** Flowchart of study procedures

The intervention group participated in structured moderate-intensity aerobic exercise (60–75% maximum heart rate), performed three times per week for eight weeks, consisting of warm-up, rhythmic aerobic movements, and cool-down phases. A daily monitoring sheet was used to document attendance, sleep duration, intensity, and any physical complaints. The control group did not receive any structured program. Somatic symptoms were measured using the validated Menopause Rating Scale (MRS) somatic domain. Pre- and post-intervention assessments were carried out under standardized conditions at the same venue, time of day, and by the same trained assessors to ensure measurement consistency. Data were analyzed using SPSS 26, applying Kolmogorov-Smirnov tests for normality and paired and independent t-tests for significance testing.

## RESULTS AND DISCUSSIONS

### Respondent Characteristics

This study involved 58 premenopausal women aged 40–55 years in Tondomulyo Village, Pati Regency, divided into 29 respondents in intervention group (aerobic exercise) and 29 respondents in control group.

**Table 1.** Characteristics of respondents

| Characteristics | Category                | Intervention Group (n=29) | Control Group (n=29) |
|-----------------|-------------------------|---------------------------|----------------------|
| Age (years)     | Mean ± SD               | 45.2 ± 4.1                | 46.1 ± 3.8           |
|                 | 40-45                   | 12 (41.4%)                | 11 (37.9%)           |
|                 | 46-50                   | 10 (34.5%)                | 12 (41.4%)           |
|                 | 51-55                   | 7 (24.1%)                 | 6 (20.7%)            |
| Education level | Elementary school       | 8 (27.6%)                 | 9 (31.0%)            |
|                 | Junior high school      | 11 (37.9%)                | 10 (34.5%)           |
|                 | Senior high school      | 8 (27.6%)                 | 8 (27.6%)            |
|                 | Higher education        | 2 (6.9%)                  | 2 (6.9%)             |
| Occupation      | Housewife               | 18 (62.1%)                | 17 (58.6%)           |
|                 | Farmer / farm laborer   | 7 (24.1%)                 | 8 (27.6%)            |
|                 | Entrepreneur            | 3 (10.3%)                 | 3 (10.3%)            |
|                 | Civil servant / teacher | 1 (3.4%)                  | 1 (3.4%)             |

Table 1 shows that the majority of respondents in both groups were aged 40-50 years, had junior high school education, and worked as housewives. The average age was similar between groups, indicating comparable baseline characteristics.

**Premenopause Physical Symptoms Before Intervention (Pre-test)**

Based on research results from 58 respondents, before aerobic exercise intervention was conducted, majority of premenopausal women in Tondomulyo Village experienced physical symptoms with severe category.

**Table 2.** Premenopause physical symptoms before intervention (pre-test)

| Variables                                  | Intervention Group (n=29) | Control Group (n=29) | p-value |
|--|---------------------------|----------------------|---------|
| MRS somatic domain total score (Mean ± SD) | 10.8 ± 2.4                | 10.3 ± 2.6           | 0.456   |
| Severity category                          |                           |                      |         |
| Severe                                     | 21 (72.4%)                | 20 (69.0%)           | –       |
| Moderate                                   | 8 (27.6%)                 | 9 (31.0%)            | –       |
| Specific symptoms (Mean ± SD)              |                           |                      |         |
| Hot flashes                                | 2.9 ± 0.8                 | 2.7 ± 0.9            | >0.05   |
| Sleep disorders                            | 2.8 ± 0.9                 | 2.6 ± 0.8            | >0.05   |
| Joint/muscle pain                          | 2.7 ± 0.8                 | 2.7 ± 0.7            | >0.05   |
| Heart complaints                           | 2.4 ± 0.7                 | 2.3 ± 0.8            | >0.05   |

Table 2 shows that before the aerobic exercise intervention, both groups had comparable MRS somatic domain scores, indicating homogeneity between groups (p = 0.456). The majority of respondents experienced severe physical symptoms, with hot flashes being the most dominant complaint. No significant differences were found between groups across all symptom types (p > 0.05).

**Premenopause Physical Symptoms After Intervention (Post-test)**

After 8 weeks aerobic exercise intervention, there was very significant difference between both groups. Intervention group experienced much greater decrease compared to control group.

**Table 3.** Premenopause physical symptoms after intervention (post-test)

| Variables                                  | Intervention Group (n=29) | Control Group (n=29) | p-value |
|--|---------------------------|----------------------|---------|
| MRS somatic domain total score (Mean ± SD) | 6.2 ± 2.1                 | 9.8 ± 2.4            | <0.001  |
| Severity category                          |                           |                      |         |
| Severe                                     | 4 (13.8%)                 | 18 (62.1%)           | –       |
| Moderate                                   | 15 (51.7%)                | 9 (31.0%)            | –       |
| Mild / Normal                              | 10 (34.5%)                | 2 (6.9%)             | –       |
| Specific symptoms (Mean ± SD)              |                           |                      |         |
| Hot flashes                                | 1.4 ± 0.8                 | 2.6 ± 0.8            | <0.001  |
| Sleep disorders                            | 1.7 ± 0.7                 | 2.5 ± 0.9            | <0.001  |
| Joint/muscle pain                          | 1.5 ± 0.7                 | 2.5 ± 0.8            | <0.001  |
| Heart complaints                           | 1.6 ± 0.6                 | 2.2 ± 0.7            | <0.001  |

Table 3 shows that after eight weeks of aerobic exercise intervention, the intervention group experienced a significant decrease in MRS somatic domain scores compared to the control group ( $p < 0.001$ ). All specific symptoms, including hot flashes, joint/muscle pain, sleep disorders, and heart complaints, showed significant reductions in the intervention group, whereas the control group demonstrated minimal changes.

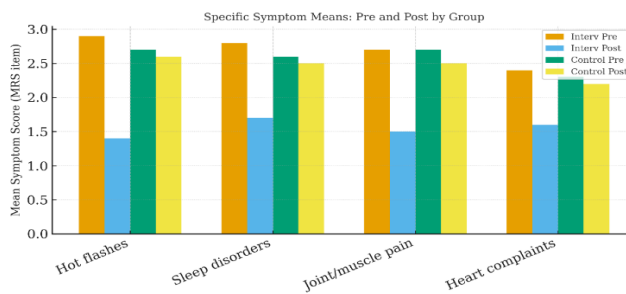
**Aerobic Exercise Effectiveness**

Effectiveness analysis using independent t-test showed that aerobic exercise was very effective in reducing premenopause physical symptoms.

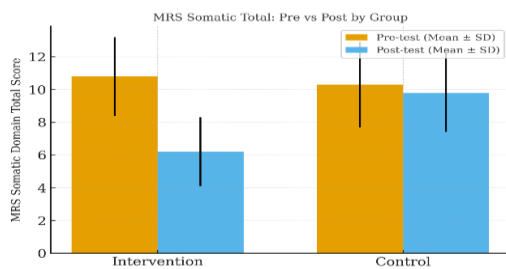
**Table 4.** Effectiveness of aerobic exercise on premenopause physical symptoms

| Variables                      | Mean Difference (Pre-Post) | t-value | p-value |
|--------------------------------|----------------------------|---------|---------|
| Intervention group (n = 29)    |                            |         |         |
| MRS somatic domain total score | -4.6 ± 1.9                 | -12.847 | <0.001  |
| Hot flashes                    | -1.5 ± 0.7                 | -11.523 | <0.001  |
| Heart complaints               | -0.8 ± 0.6                 | -7.182  | <0.001  |
| Sleep disorders                | -1.1 ± 0.8                 | -7.423  | <0.001  |
| Joint/ muscle pain             | -1.2 ± 0.7                 | -9.263  | <0.001  |
| Control group (n = 29)         |                            |         |         |
| MRS somatic domain total score | -0.5 ± 1.8                 | -1.456  | 0.156   |
| Hot flashes                    | -0.1 ± 0.4                 | -1.125  | 0.267   |
| Heart complaints               | -0.1 ± 0.3                 | -1.325  | 0.198   |
| Sleep disorders                | -0.1 ± 0.5                 | -0.964  | 0.342   |
| Joint/ muscle pain             | -0.2 ± 0.4                 | -1.732  | 0.089   |
| Effect size (Cohen's d)        | 2.19                       | —       | —       |

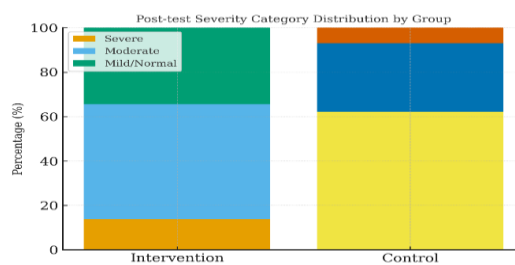
Table 4 demonstrates that aerobic exercise produced a significant reduction in MRS somatic domain scores among premenopausal women in the intervention group ( $p < 0.001$ ). The effect size (Cohen's  $d = 2.19$ ) indicates a very large clinical effect, suggesting that aerobic exercise provides substantial and meaningful improvement in physical symptoms compared to no intervention.



**Figure 2.** Specific symptom means: pre and post by group



**Figure 3.** MRS somatic total



**Figure 4.** Post-test severity category distribution

### **Premenopause Physical Symptoms Before Aerobic Exercise in Tondomulyo Village**

Based on research results from 58 respondents, before aerobic exercise intervention was conducted, majority of premenopausal women in Tondomulyo Village experienced physical symptoms with severe category. High prevalence of severe category premenopause physical symptoms in this study is in line with Fruitasari (2024) research showing that 75% women experience premenopause symptoms with varying intensity, and approximately 25% report symptoms severe enough to interfere with daily activities.

Pathophysiology of premenopause physical symptoms is related to gradual decrease in estrogen hormone production, causing instability of various body's physiological systems (Patel et al., 2025). According to Chen (2023), in premenopause phase there is drastic decrease in number of ovarian follicles to remaining approximately 1,000 follicles, causing ovaries less responsive to gonadotropin stimulation and triggering hormonal fluctuations responsible for various physical symptoms (Chen et al., 2023).

The pattern of symptoms observed in this study—where hot flashes were the most frequently reported, followed by sleep disturbances, musculoskeletal discomfort, and cardiovascular-related sensations—mirrors national prevalence data among Indonesian women (RI, 2022). The predominance of vasomotor symptoms is aligned with previous explanations that disturbances in hypothalamic thermoregulation, triggered by hormonal fluctuations, heighten sensitivity to temperature changes and contribute to hot flash episodes (Gombert-Labedens et al., 2025).

### **Premenopause Physical Symptoms After Aerobic Exercise in Tondomulyo Village**

Following the eight-week aerobic exercise intervention, a clear and substantial difference emerged between the intervention and control groups, indicating that the women who participated in the exercise program demonstrated a markedly greater reduction in somatic symptoms. This consistent improvement across all symptom categories illustrates that aerobic exercise provides meaningful therapeutic benefits for premenopausal women. Several physiological responses triggered by exercise may help explain these outcomes. Aerobic activity is known to elevate endorphin levels, functioning as a natural analgesic; Philip et al. (2025) reported an increase of up to 67% in endorphin concentrations immediately after exercise, which may contribute to reductions in musculoskeletal discomfort and improved overall well-being (Philip et al., 2025).

Beyond analgesic effects, aerobic exercise also appears to influence thermoregulatory stability an important factor in the management of vasomotor symptoms. Regular aerobic movement may help recalibrate the hypothalamic thermoregulation center, which becomes unstable due to estrogen fluctuations during premenopause (Carpeggiani Weber et al., 2025; Ombert-Labedens et al., 2025). By enhancing heat-dissipation efficiency and improving tolerance to temperature variations, exercise can reduce susceptibility to hot-flash triggers (Witkowski et al., 2023; X. Xu et al., 2024). These effects are supported by evidence suggesting that sympathetic overactivity and heightened norepinephrine levels contribute to hot flashes, and that exercise may help attenuate these responses (Wasley & Gailey, 2024).

The per-symptom analysis in this study reinforces these mechanisms, showing a consistent decrease across all four somatic domains, with hot flashes exhibiting the greatest reduction (51.7%). This pattern of improvement mirrors findings from broader research. For instance, a meta-analysis demonstrated that moderate-intensity aerobic activity can reduce hot flash frequency by as much as 58% and enhance sleep quality by up to 42% (Sun et al., 2024). Taken together, these results underscore the comprehensive nature of aerobic exercise in addressing the multisystem symptoms associated with premenopause and highlight its value as a practical and effective non-pharmacological intervention.

### **Aerobic Exercise Effectiveness on Premenopause Physical Symptoms Reduction in Tondomulyo Village**

Effectiveness analysis using independent t-test showing that aerobic exercise is very effective in reducing premenopause physical symptoms proves that this intervention provides not only statistically significant but also clinically meaningful benefits. Cohen's d effect size of 2.19 indicating very large clinical effect means that aerobic exercise provides benefits that dramatically improve respondents' quality of daily life.

This effectiveness is supported by comprehensive physiological mechanisms. Liang et al. (2025) reported that aerobic exercise causes 23% decrease in cortisol and 18% increase in serotonin, which play role in improving sleep quality and mood stabilization (Liang et al., 2025). In addition, regular aerobic exercise increases cardiorespiratory capacity and improves thermoregulation system function, as demonstrated in Qian (2023) polysomnographic study showing improvement in sleep architecture after aerobic exercise program (Qian et al., 2023).

This research is in line with several previous studies showing effectiveness of aerobic exercise in reducing premenopause symptoms. Low-impact aerobic exercise effectively reduced vasomotor, psychological, and somatic complaints among premenopausal women (Vanderzalm et al., 2023; Yenifebriani et al., 2025). Before the intervention, respondents experienced an average of up to four vasomotor symptoms, which decreased to two symptoms after participating in the exercise program. Similarly, the number of psychological complaints declined from three to one symptom per respondent following the intervention. Meanwhile, vasomotor complaints that initially persisted in one respondent remained stable at a single complaint post-intervention, indicating the overall beneficial effect of aerobic exercise in alleviating multiple premenopausal symptoms (Reeves et al., 2024). Kusumawati et al. (2022) study reported 38.5% reduction in musculoskeletal pain complaints and 42.3% reduction in fatigue after 12 weeks aerobic exercise program 3 times per week (Kusumawati & Hidayati, 2022).

Superiority of intervention group in this study proves that aerobic exercise not only provides symptom improvement, but very superior improvement compared to not doing specific intervention, so it can be recommended as main therapy choice to address premenopause physical symptoms. This has important practical implications for health service policy development, especially in community-based preventive approach in addressing increasing premenopausal women population health problems.

Results of previous research on analysis of causes of premenopausal mothers' physical symptoms showed that physical activity is one of dominant factors affecting premenopause symptom intensity, with regression coefficient of -1.125 ( $p=0.007$ ) indicating that increased physical activity can significantly decrease physical symptoms in premenopausal women. This finding is strengthened by experimental research results on aerobic exercise effectiveness in Tondomulyo Village which proved that aerobic exercise intervention for 8 weeks with frequency of 3 times per week was able to drastically decrease MRS somatic domain score from  $10.8 \pm 2.4$  to  $6.2 \pm 2.1$  (42.6% decrease) in intervention group, compared to control group which only experienced minimal decrease from  $10.3 \pm 2.6$  to  $9.8 \pm 2.4$  (4.9% decrease).

Consistency of results of these two studies confirms that structured physical activity such as aerobic exercise is not only negatively correlated with premenopause physical symptoms, but also proven experimentally to be effective intervention with Cohen's d effect size of 2.19, showing very large clinical effect in reducing various premenopause physical symptoms including hot flashes (51.7% decrease), joint/muscle pain (44.4%), sleep disorders (39.3%), and heart complaints (33.3%). Practical implications of these two previous studies are very relevant to current research context, where proven effective aerobic exercise program can be implemented as community-based intervention to address premenopause physical symptoms problem whose prevalence continues to increase along with Indonesia's demographic transition.

Although the intervention demonstrated strong effectiveness, certain limitations reduce the generalizability of the findings. First, the sample was limited to rural premenopausal women in a single geographical area with relatively homogeneous sociodemographic backgrounds, which may not reflect urban or multi-ethnic populations. Second, the quasi-experimental design, while strengthened by random sampling and block randomization, does not offer the same level of control as a full randomized controlled trial. Third, adherence was high but self-reported monitoring sheets may introduce reporting bias. Therefore, caution should be exercised when applying these results to broader populations, and future studies should include larger and more diverse cohorts.

## CONCLUSION

This study confirms that aerobic exercise effectively alleviates physical symptoms among premenopausal women, directly supporting the research objective to identify non-pharmacological strategies for managing premenopausal discomfort. After 8 weeks of intervention, women who engaged in regular aerobic exercise experienced a substantial reduction in somatic symptoms, with improvements far exceeding those in the control group. These findings highlight the strong therapeutic potential of aerobic exercise, particularly in reducing hot flashes, joint and muscle pain, sleep disturbances, and cardiovascular-related complaints. Future studies are recommended to explore long-term effects, compare different types or intensities of exercise, and examine broader psychosocial outcomes. Research involving larger and more diverse populations will also strengthen the generalizability of these findings and support the development of comprehensive community-based intervention programs.

However, several limitations must be acknowledged when interpreting these findings. From a research design perspective, the quasi-experimental approach, although strengthened by random sampling and block allocation, does not eliminate the possibility of unmeasured confounding variables. Additionally, the reliance on self-reported monitoring sheets may introduce recall or reporting bias. In terms of sample and external validity, the study was conducted in a single rural village with relatively homogeneous sociodemographic characteristics, which limits the generalizability of the results to more diverse or urban populations. The short intervention duration also prevents assessment of long-term sustainability of symptom improvement.

Despite these limitations, the findings provide important evidence supporting aerobic exercise as a viable community-based intervention. Future research should incorporate randomized controlled trial designs, larger and more diverse samples, and longer follow-up periods to enhance the robustness and generalizability of the results. Such efforts will help inform the development of comprehensive public-health strategies aimed at improving the well-being of women during the premenopausal transition.

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