

Original Research

# Post-Pandemic Health Conditions and Influence of Twelve Weeks of Yogic Practices on Young to Middle-Aged Housewives in Rural and Urban Environments

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## Abstract

**Background:** The COVID-19 pandemic has precipitated adverse effects on the physical and mental health of young to middle-aged housewives residing in diverse rural and urban environments. Despite the widespread repercussions, there exists a paucity of research focused on elucidating the post-COVID health status of this specific demographic and the potential therapeutic merits associated with the integration of yogic practices into their daily lives.

**Objective:** This study aims to scrutinize the post-Covid health status of young to middle-aged housewives and explore the potential advantages of integrating yogic practices within their routines.

**Methods:** The study included sixty young to middle-aged housewives, thirty from rural and 30 from urban areas and categorised as rural controlled (n=15), rural experimental (n=15), urban controlled (n=15) and urban experimental (n=15). Both the experimental groups followed twelve weeks yogic practice protocol based on the Ministry of AYUSH's Common Yoga protocol.

**Results:** Urban housewives exhibited a higher body mass index and a higher percentage of body fat. The yogic intervention had a significant effect on BMI ( $p = 0.02$ ), muscular endurance ( $p = 0.002$ ), and flexibility ( $p = 0.001$ ) among rural young to middle-aged housewives. However, only improvement in flexibility ( $p = 0.0005$ ) has been observed in urban young to middle-aged housewives. These outcomes highlight the potential positive impact of twelve-week yogic intervention in improving selected physical parameters of young to middle-aged housewives.

**Conclusion:** The findings of the study emphasize the importance of yogic practice, into post-pandemic recovery efforts to promote optimal health and resilience in diverse populations. Further research is warranted to explore the long-term effects and sustainability of such interventions on overall health outcomes.

**Keywords:** Covid-19; common yoga protocol; physical fitness; yoga; middle aged housewives

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## Background

The influential significances of the COVID-19 pandemic have left an indelible mark on numerous facets of society, profoundly affecting the physical and mental well-being of individuals (Almeida et al., 2020). Among the adversely impacted groups, young to middle-aged housewives residing in both rural and urban area have faced various challenges

due to the disruptions (Violant-Holz et al., 2020). The COVID-19 pandemic led to increased hypokinetic behaviours because of lockdown, social distancing and closure of outdoor areas. These led to high levels of stress and reduced physical activity, which negatively affected the health of young to middle-aged housewives. The metabolism and immune system were broadly affected by prolonged stress and inactivity.

The physical fitness of young to middle-aged housewives are related to their ability of performing daily household activities actively and without exhaustion. The health status of young to middle-aged housewives usually impacted by household responsibilities, lack of time for personal care, sedentary life styles and health conditions such as joint pain or obesity. The physical postures and mental practices of yoga can reduce stress while at the same time improving flexibility, strength and cardiovascular fitness. But only a few studies explore post-COVID health status of Young to middle-aged housewives, along with the potential advantages of incorporating yoga practices into their lives to meet pandemic challenges (Capela Santos et al., 2023; Cox et al., 2022). From this point of view, the study seeks to address this gap by delving into the post-COVID health status of young to middle-aged housewives, with a specific emphasis on evaluating their health-related physical fitness.

Additionally, the study will explore the potential advantages of incorporating Yoga into daily routines. Moreover, young to middle-aged housewives are more susceptible to developing comorbidities due to age-related declines in physiological function and immune response. Addressing the current knowledge gap, investigating the effect of yoga practices on physical fitness can provide useful information for improved health outcomes. Previous research has highlighted the potential benefits of various yogic practices, including asanas, pranayama and meditation, in enhancing various health outcomes (Cox et al., 2022; Yefremenko et al., 2024). The study will provide a customised yoga program based on their unique needs and time constraints to improve their physical well-being in the post-COVID period.

## **Methods**

### **Study design**

The study employed a randomized experimental block design. Computer-generated software (Random Number Generator v1.4) was employed for fair and unbiased randomization to eliminate selection bias. Volunteers were classified as urban or rural based on their living area and subsequently allocated to control or experimental groups.

### **The Participants**

The research involved only young to middle-aged housewives between the ages of 30 to 45 years, who lived in urban or rural settings. Only those participants provided informed consent and were interested to involve with the yoga practice protocol. Participants had to showcase their physical capacity to undergo fitness tests and have no prior experience with structured yoga program intervention to be intended for the study. Participants were limited to individuals who did not have serious chronic diseases or medical contraindications.

Participants with a history of major injuries, musculoskeletal diseases or medical conditions that prevent physical activity were excluded from the study. Participants who were already enrolled in other fitness or yoga programs or were on medications that may impact the result of the study as well as physical performance of the participants were excluded from the study. Individuals were excluded from the study if they were pregnant, planning to become pregnant, experiencing high stress levels or irregular sleep patterns, or unwilling to commit to attending one-hour sessions three times a week for 12 weeks.

### **Measuring variables**

The study involved a thorough investigation into fundamental aspects of personal, physical, and health-related physical fitness both prior to and following a 12-week yogic program. Personal characteristics, such as age, were verified through the submission of age proof certificates. Physical attributes, including height, were measured using a stadiometer (Seca 213 Portable Stadiometer), while body mass was determined using a weighing scale (Omron HN 289). Body composition, indicated by the percentage of body fat, was computed utilizing Harpenden skinfold calipers (Baty International). According to the guidelines of the International Society for the Advancement of Kinanthropometry (ISAK), level one anthropometries was hired to measure triceps, biceps, subscapular, and suprailiac skinfolds to determine the percentage of body fat using the Durnin & Womersley method (Durnin & Womersley, 1974). Health-related physical fitness components underwent evaluation through various tests and procedures. These encompassed the assessment of cardiovascular endurance (predicted  $\dot{V}O_{2\max}$ ) via a 12-minute walk or run on a 400m track, muscular endurance gauged by the number of sit-ups completed in one minute, muscular strength evaluated using a hand grip dynamometer (JAMAR Hydraulic Hand Dynamometer) and flexibility determined by the sit and reach test with a sit and reach box (Baseline 12-1085 Sit n' Reach Trunk Flexibility Box). The comprehensive measurements were designed to offer a profound insight into participants' physical fitness levels and to track changes subsequent to the 12-week yogic intervention. Though the

standard equipment was employed in data collection, the researcher still tested for the validity (concurrent) and reliability (split-half method) of the equipment. The validity was between 0.81 and 0.96, and the reliability was between 0.87 and 0.98.

Random Number Generator v1.4 software has been used to reduce selection bias via unbiased allocation of participants to the control and experimental groups. Measurement bias was reduced through the use of standardised tools and a qualified yoga instructor to guarantee consistent application of the yoga protocol. Performance bias was minimised through direct supervision during the sessions. The participants were also instructed to maintain their regular routines, refraining from external influences that could impact the results

### Protocol of Yogic Practice

In collaboration with two esteemed professors, the researcher devised a tailored yogic practice protocol for the Experimental Group (EG) of housewives, taking inspiration from the Common Yoga protocol presented by the Ministry of AYUSH, Government of India, for International Yoga Day in 2019 (Dr. Ishwar V. Basavaraddi, 2019). Three afternoon sessions per week were scheduled for the yogic practice based on the availability of EG housewives. The yogic practice sessions for the experimental group volunteers commenced in the 1st week of July 2022 and continued until the last week of October 2022. Participant attendance was monitored using attendance sheets and direct supervision by a certified yoga instructor. Non-compliance was addressed through motivational discussion sessions, feedback collection, and adaptable scheduling to encourage regular participation. In contrast, the Controlled Group (CG) women did not receive any specific therapy or prescribed activities. CG housewives were instructed to adhere to their regular daily routines throughout the study, with their involvement limited to the collection of pre- and post-test data.

The recommended yogic practices for the experimental group of housewives encompass a comprehensive series of asanas and pranayamas designed to enhance both physical and mental well-being. The session initiates with two cycles of Sun Salutation, each lasting 180 seconds, with a 60-second rest between repetitions and a 120-second rest before transitioning to the subsequent exercise. Subsequently, participants engage in Padahasthasana (2 repetitions, 30 seconds per repetition, 30 seconds rest), Padmasana (2 repetitions, 30 seconds per repetition, 30 seconds rest), Naukasana (2 repetitions, 30 seconds per repetition, 30 seconds rest), Bhujangasana (2 repetitions, 30 seconds per repetition, 30 seconds rest), and Anulom Vilom (2 repetitions, 60 seconds per repetition, 30 seconds rest). The sequence concludes with a 120-second meditation, resulting in a total session time of approximately 25 minutes, excluding the warm-up session. Young to middle-aged housewives often face time constraints due to their multiple household responsibilities. So a shorter, manageable yoga protocol is more feasible and sustainable, enhancing adherence.

### Data analysis

Descriptive statistics were utilized to portray all the datasets and inferential statistics were applied to assess the data variations among distinct groups. The Anderson-Darling normality test was employed to understand the distribution pattern of the data, and the majority of the dataset was found to be normal. Levene's F-test was also applied to assess variances across different groups in the dataset and finally a one-way analysis of variance (ANOVA) was employed based on the distribution pattern of the dataset. The study adopted a significance level of  $\alpha = 0.05$ . Statistical analysis, interpretation of data, and visual representation were conducted using Microsoft Office Professional Plus 2010 and the Gnumeric Spreadsheet.

## Results

The demographic characteristics of rural Young to middle-aged housewives show that the experimental group has a significantly lower BMI ( $p = 0.02$ ) compared to the controlled group.

**Table 1.** Demographic characteristics rural middle-aged housewives

Parameters	RCG Pre Test	REG Pre Test	RCG Post Test	REG Post Test	p value
Age (y)	37.9 $\pm$ 3.6	37.4 $\pm$ 4.0	37.9 $\pm$ 3.6	36.1 $\pm$ 4.0	0.97
Height (cm)	153.6 $\pm$ 2.4	154.0 $\pm$ 3.7	153.6 $\pm$ 2.4	154.0 $\pm$ 3.7	0.96
Body Mass (kg)	56.2 $\pm$ 2.7	61.5 $\pm$ 6.1	57.6 $\pm$ 2.2	59.8 $\pm$ 6.2	0.54
BMI (kg/m <sup>2</sup> )	23.8 $\pm$ 1.0	25.9 $\pm$ 2.4 <sup>a</sup>	24.4 $\pm$ 1.0	25.2 $\pm$ 2.4	0.02

Data are represented as Mean  $\pm$  SD, a=Compared to rural controlled Gr. Pre-test; b= Compared to rural Ex. Gr.

Pre-test; c= Compared to rural controlled Gr. Post-test, Level of significance: \* =  $\leq 0.05$

No significant difference has been observed in the demographic characteristics of urban Young to middle-aged housewives.

**Table 2.** Demographic characteristics Urban middle aged housewives

Parameters	UCG Pre Test	UEG Pre Test	UCG Post Test	UEG Post Test	p value
Age (y)	37.3 ± 4.9	36.1 ± 4.0	37.3 ± 4.9	36.1 ± 4.0	0.98
Height (cm)	153.7 ± 4.2	154.3 ± 4.7	153.7 ± 4.2	154.3 ± 4.7	0.98
Body Mass (kg)	57.8 ± 5.6	61.2 ± 6.6	58.5 ± 5.0	59.4 ± 6.4	0.44
BMI (kg/m <sup>2</sup> )	24.4 ± 1.8	24.7 ± 1.7	26.1 ± 3.2	25.3 ± 3.1	0.23

In the rural experimental group, significant improvements were observed in abdominal muscular endurance ( $p = 0.002$ ), flexibility ( $p = 0.001$ ), and a notable decrease in body fat percentage ( $p = 0.02$ ). No significant changes were noted in the rural control group and  $\dot{V}O_2$  max across both groups. These findings emphasize the positive impact of yogic practices on specific physical aspects for Young to middle-aged housewives.

**Table 3.** Basic physical overview of rural middle aged housewives

Physical Parameters	RCG Pre Test	REG Pre Test	RCG Post Test	REG Post Test	p value
Muscular Endurance (Abdominal) (no)	11.4 ± 3.4	12.2 ± 3.1	12.9 ± 2.9	16.7 ± 3.5 <sup>a#,c*,cΔ</sup>	0.002
Muscular Strength (Right Hand) (kg)	25.5 ± 3.0	26.5 ± 3.6	26.6 ± 2.4	27.1 ± 3.3	0.57
Muscular Strength (Left Hand) (kg)	25.1 ± 2.8	25.5 ± 2.8	25.3 ± 2.9	25.2 ± 2.7	0.69
Flexibility (cm)	9.7 ± 1.5	9.3 ± 2.6	9.3 ± 1.4	12.0 ± 2.7 <sup>a*,b*,c*</sup>	0.001
Percentage of body fat (%)	28.0 ± 2.4	29.8 ± 2.9	28.7 ± 2.1	28.10 ± 2.7	0.32
$\dot{V}O_2$ max (ml/kg/min)	45.7 ± 13.6	44.3 ± 8.3	46.2 ± 11.3	50.1 ± 7.1	0.35

Data are represented as Mean ± SD, a=Compared to rural controlled Gr. Pre-test; b= Compared to rural Ex. Gr. Pre-test; c= Compared to rural controlled Gr. Post-test, Level of significance: \* =  $\leq 0.05$ , # =  $\leq 0.01$ , Δ =  $\leq 0.001$

Urban Young to middle-aged housewives were assessed by comparing pre-test and post-test results between the controlled and experimental groups. A significant improvement has been observed in the flexibility of urban experimental group housewives. Improvements are also observed in abdominal muscular endurance, right and left-hand muscular strength, and predicted  $\dot{V}O_2$  max in the experimental group post-intervention. However, the differences in these parameters did not reach statistical significance.

**Table 4.** Basic physical overview of urban middle-aged housewives

Physical Parameters	UCG Pre Test	UEG Pre Test	UCG Post Test	UEG Post Test	p value
Muscular Endurance (Abdominal) (no)	10.7 ± 3.1	11.2 ± 2.9	11.8 ± 3.5	13.4 ± 3.4	0.37
Muscular Strength (Right Hand) (kg)	22.7 ± 3.1	26.5 ± 3.6	24.9 ± 1.9	27.1 ± 3.3	0.54
Muscular Strength (Left Hand) (kg)	22.6 ± 3.1	25.5 ± 2.8	24.0 ± 1.7	25.2 ± 2.7	0.69
Flexibility (cm)	9.3 ± 2.1	9.4 ± 2.4	8.7 ± 1.4	11.9 ± 2.5 <sup>a#,b*,c#</sup>	0.0005
Percentage of body fat (%)	30.7 ± 3.9	32.4 ± 2.9	31.0 ± 3.9	31.0 ± 2.7	0.51
$\dot{V}O_2$ max (ml/kg/min)	43.9 ± 11.6	44.2 ± 11.7	43.0 ± 10.9	49.6 ± 9.8	0.36

Data are represented as Mean ± SD, a=Compared to Urban controlled Gr. Pre-test; b= Compared to Urban Ex. Gr. Pre-test; c= Compared to Urban controlled Gr. Post-test, Level of significance: \* =  $\leq 0.05$ , # =  $\leq 0.01$ , Δ =  $\leq 0.001$

The rural experimental group showed significant improvements in abdominal muscular endurance, muscular strength, flexibility, and reduced body fat. The urban experimental group also saw positive changes in flexibility. However, no significant alterations were observed in muscular strength, body fat percentage, and  $\dot{V}O_2$  max across both rural and urban control groups. These results emphasize the impactful intervention, suggesting benefits for both rural and urban Young to middle-aged housewives

## Discussion

Understanding the characteristics of diverse groups is essential to exploring the unique needs, challenges, and objectives of individuals within a particular demographic. Based on the 2011 Indian Census, a high percentage of women were aged between 30 and 40 years (Rajan et al., 2015). In this age group, women tend to have many responsibilities concerning family, career and personal growth. Therefore, knowledge of the demographic characteristics of Indian women in their middle age provides important information about their daily lives and challenges. Due to India's size and diversity, it is important to classify young to middle-aged housewives based on their residential areas (urban or rural) and examine the impact of a consistent yoga practice on their physical, mental and emotional well-being. Inclusivity in society and an understanding of the distinct challenges of this group can result in enhanced empowerment and overall well-being.

Height is a complex attribute determined by lifestyle, environmental and genetic factors. A comparison of the mean height of particular cohorts, for example, middle-aged Indian women, reveals information on anthropometric heterogeneity and population well-being. Mamidi et al. (2011) observed that women aged 30–39 years had a mean height of about 156.4 cm (SD = 5.7 cm) (Mamidi et al., 2011). Likewise, Singh et al. (2015) obtained a mean height of 154.7 cm (SD = 5.2 cm) among working women aged 25–44 years (I. Singh et al., 2015). These observations indicate that middle-aged Indian women have a mean height ranging from 154 to 156 cm. Regional differences also come into play. Housewives, especially in rural India, can be shorter than the national average owing to variations in socioeconomic status and nutritional intake. Variables such as maternal education and household wealth, which are directly related to adult height, should also be taken into account (Singh et al., 2023). These differences emphasize the need to control for ethnic and geographical variations when examining anthropometric characteristics in India.

Body mass is an important marker of general physical condition. Research indicates that regular practice of yoga can result in lower body mass. According to the NFHS-4 (2015–16), average BMI of Indian women aged 30–39 years was 22.9 kg/m<sup>2</sup> (Ministry of health and family welfare, 2017). However, BMI of young to middle-aged housewives is higher because of sedentary lifestyles and the COVID-19 pandemic-related changes. Although Nagarathna et al. (2021) and Sharma et al. (2024) studies showed that yoga lowers BMI significantly; but results of the present study did not achieve statistical significance (Nagarathna et al., 2021; Sharma et al., 2024). This difference could be due to the intervention period or differences in the baseline activity levels and eating habits of the participants. Rural housewives might also have some manual work, which compensates for sedentary activities, whereas urban participants might not. The absence of significant BMI changes could also be attributed to the relatively short intervention period, which may not have been long enough to yield measurable decreases in body weight or BMI. These constraints indicate that future research should have longer intervention periods or include dietary changes along with yoga interventions.

The results of this study emphasize the contribution of yoga towards enhanced muscular endurance. The results concur with earlier studies showing that yoga, with its focus on static postures and isometric contractions, makes a positive contribution towards muscular endurance (Nagarathna et al., 2021). The differential effect found between rural and urban participants, however, indicates the role of baseline physical activity levels in modulating the efficacy of yoga practice. Rural housewives, being more involved in physical labor, showed higher gains in muscular endurance than their urban counterparts. This implies that prior muscle activation through everyday activities such as farming and manual work provides a platform that reinforces the effectiveness of yoga practice. The failure to find significant improvements in muscular endurance among urban participants indicates that a sedentary lifestyle and limited physical activity could interfere with the potential effects of yoga. This result concurs with research findings emphasizing the effect of a physically inactive lifestyle on diminished muscular endurance (Sujatha, T., & Elangovan, 2020). Considering that urban lifestyles involve extended sitting, technological dependence, and less scope for physical activity, it is likely that yoga alone might not be effective in causing meaningful improvements in muscular endurance without supplemental strength or resistance training interventions. Young to middle-aged women, especially urban ones encounter various obstacles in sustaining muscular endurance, such as hormonal changes, domestic duties and limited access to organized exercise programs. Removal of these obstacles is necessary to promote physical health in this population. Combining yoga with other resistance and aerobic training modalities may potentially produce more meaningful improvements in muscular endurance and overall fitness. Furthermore, the mind-body connection focused on in yoga could have also played a role in producing the gains observed in neuromuscular coordination and concentration, further supporting muscular endurance. The incorporation of breath control and mindfulness in yoga practice could prove instrumental in maintaining muscle engagement and endurance over the long term.



In the context of general physical fitness, hand strength plays a key role, particularly for the performance of daily functions and functional activities. Middle-aged Indian women predominantly face hand strength problems because of issues related to aging and lifestyles of sedentarism. Following intervention of Wong et al. (2023) intervention yoga can help increase hand grip strength in older women (Wong et al., 2023). Though changes in hand strength in this study were not statistically significant, the variations could be due to yogic timetables and choice of asanas. An intensive intervention involving the specific inclusion of asanas aiming to enhance hand and wrist strength could produce significant improvements.

The results of the study suggest that a yoga practice protocol prescribed as part of this study substantially enhances flexibility among both rural and urban experimental group volunteers. The result is consistent with earlier studies conducted by Sandhu and Singh (2017) and Donahoe-Fillmore et al. (2010), who also recorded significant improvements in flexibility after conducting yoga interventions (Donahoe-Fillmore, et al., 2010; Sandhu & Singh, 2017). Improvements in flexibility are brought about by the dynamic and static yoga postures that stretch the muscles, enhance the mobility of the joints, and enhance elasticity in the muscles. Furthermore, incorporating Anulom-Vilom and meditation exercises induces relaxation and facilitates release of muscle tension via controlled respiration. Such effects are particularly useful for individuals who are young to middle-aged and may experience diminishing flexibility with advancing age or leading a sedentary life.

The research discovered a decrease in body fat percentage, but the difference was not statistically significant. The duration and intensity of the yoga intervention, baseline fitness, individual response, and measurement tools could have had an effect on the findings. Although earlier research indicates that yoga can have a positive effect on body fat percentage, more intense or longer interventions might be required for significant improvements, with diet, lifestyle, and emotional health also contributing.

Multiple studies point to the possible cardiovascular benefits of yoga. A study conducted by Ramos-Jiménez et al. (2009) showed that Hatha Yoga improved  $\dot{V}O_2$  max and exercise tolerance in middle-aged Mexican women who practiced yoga (Ramos-Jiménez et al., 2009). Yet when comparing this study with the present study in young to middle-aged housewives, only slight changes in  $\dot{V}O_2$  max were noticed. This divergence indicates that though yoga may contribute to some degree of cardiovascular gain, it might not be effective enough on its own to deliver considerable increases in aerobic capacity in the absence of other specific interventions, like increased-intensity aerobic exercises. Differences in baseline physical fitness levels, the intensity of the yoga protocol, and participants' habitual physical activity levels might account for variability in findings between the Mexican cohort and the current sample. Mexican participants, for instance, might have had elevated levels of habitual physical activity or other lifestyle parameters that contributed to greater cardiovascular gain. Thus, the study postulates that whereas yoga can assist in cardiovascular improvement, more rigorous and structured aerobic exercises may be required to obtain considerable improvements in aerobic capacity, particularly in the case of housewives or inactive populations.

This research investigates the effects of yoga interventions on middle-aged women, with positive changes in flexibility, muscular endurance, and mental health, but no statistically significant improvements in body mass index (BMI), body fat percentage, or cardiovascular endurance. The study's limitations are the brief intervention period, different baseline fitness levels, and influences such as diet and physical activity outside yoga. To effectively design yoga programs for middle-aged women with heterogeneous lifestyles, it is advisable to make sessions context-specific based on urban or rural settings, include a combination of flexibility and aerobic exercises, and provide short, accessible classes (20–30 minutes). Programs must be progressive, allow for differences in fitness levels, and offer modifications for specific needs. Incorporating social support through group environments, incorporating mindful eating, and encouraging light physical activity in addition to yoga can further increase its benefits. Finally, culturally appropriate approaches are essential to making yoga accessible and empowering for all women, improving their overall physical and psychological health.

## Conclusion

Women's health broadly depends on a complex interplay of hereditary, environmental, lifestyle, prenatal, early childhood, socioeconomic, and other variables. Interestingly, the incorporation of yoga practices is a noteworthy aspect, especially for women between the ages of 30 and 40, given the worldwide effects of the COVID-19 pandemic. These findings highlight the life-changing effects of regular yoga practice, particularly advantageous for women living in rural areas. Although the consequences for urban women are less severe, our suggested yoga program stands out as a hands-on and inclusive strategy that could improve physical health in the changing post-pandemic environment. This emphasizes the crucial role of adopting yoga practices in the modern era for overall well-being.

### Declaration of conflicting interest

The authors declare no conflict of interest for the study.

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## Author contributions

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