

Long-Term Effectiveness of a Community-Based Hatha Yoga Programme on Healthy Ageing, Functional Independence, and Lifestyle Disease Risk among Older Adults

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ABSTRACT

Population ageing has emerged as one of the defining demographic trends of the twenty-first century. Advances in healthcare, improved nutrition, and declining mortality have increased life expectancy worldwide, resulting in a growing proportion of older adults. While increased longevity is a positive achievement, it is frequently accompanied by age-related declines in physical function, mobility, cardiovascular health, cognitive performance, and psychological well-being. Sedentary behaviour, chronic stress, and lifestyle-related diseases further accelerate functional decline, increasing healthcare expenditure and reducing quality of life. Consequently, there is an increasing need for sustainable, community-based interventions that promote healthy ageing and preserve functional independence among older adults.

Hatha Yoga has gained considerable scientific attention as a holistic mind-body practice that integrates physical postures (asanas), breathing techniques (pranayama), meditation, and relaxation. Unlike conventional exercise programmes that primarily focus on physical conditioning, Hatha Yoga simultaneously addresses physical fitness, emotional resilience, balance, flexibility, respiratory efficiency, and psychological well-being. Although short-term studies have demonstrated beneficial effects of yoga, evidence regarding the long-term effectiveness of community-based Hatha Yoga programmes remains comparatively limited.

The present study proposes to investigate the long-term impact of a structured community-based Hatha Yoga programme on healthy ageing, functional independence, and lifestyle disease risk among older adults. A longitudinal experimental design will be employed involving adults aged 60 years and above residing in community settings. Participants will undergo a standardized Hatha Yoga intervention over an extended period, with periodic assessments of physical function, balance, flexibility, cardiovascular health, metabolic indicators, psychological well-being, and quality of life.

The findings are expected to provide evidence supporting Hatha Yoga as a practical, low-cost, and accessible preventive health intervention capable of promoting active ageing, reducing lifestyle disease risk, and maintaining functional independence. The study may contribute to public health policy, community healthcare planning, geriatric rehabilitation, and healthy ageing initiatives by providing an evidence-informed model for sustainable community wellness programmes.

Keywords- Hatha Yoga, Healthy Ageing, Functional Independence, Community Health, Older Adults, Lifestyle Disease, Preventive Healthcare, Active Ageing, Quality of Life, Longitudinal Study.

1. INTRODUCTION

Population ageing has become one of the most significant demographic and public health developments across the world. Improvements in medical care, sanitation, nutrition, education, and socioeconomic conditions have substantially increased life expectancy, resulting in a rapidly expanding older adult population. According to international public health organizations, the proportion of individuals aged sixty years and above is expected to continue increasing over the coming decades. This demographic transition presents both opportunities and challenges. While longer life expectancy reflects improvements in human development, ageing populations require effective strategies to maintain health, independence, and quality of life throughout later adulthood.

Ageing is a complex biological process characterized by gradual physiological, psychological, and social changes. Normal ageing is associated with reductions in muscular strength, flexibility, balance, bone density, cardiovascular efficiency, respiratory capacity, and neuromuscular coordination. Cognitive processing speed may decline, while chronic diseases such as hypertension, diabetes mellitus, cardiovascular disorders, osteoporosis, obesity, arthritis, and metabolic syndrome become increasingly prevalent. Simultaneously, retirement, social isolation, bereavement, financial concerns, and reduced physical activity may negatively influence emotional well-being and overall quality of life.

An important concept within geriatric health is healthy ageing, which extends beyond longevity to emphasize the preservation of functional ability, independence, and meaningful participation in society. Healthy ageing enables older adults to perform daily activities independently, maintain mobility, engage socially, and preserve psychological well-being despite age-related physiological changes. Contemporary healthcare therefore emphasizes preventive approaches that delay functional decline rather than focusing exclusively on disease treatment.

One of the most significant contributors to unhealthy ageing is physical inactivity. Sedentary behaviour has become increasingly common among older adults because of retirement, reduced occupational demands, limited recreational opportunities, chronic illness, and mobility restrictions. Prolonged physical inactivity accelerates muscle loss, reduces cardiovascular fitness, impairs balance, decreases flexibility, and increases susceptibility to chronic diseases. Furthermore, sedentary lifestyles contribute to social isolation, anxiety, depression, reduced confidence, and diminished functional independence.

Regular physical activity is widely recognized as one of the most effective non-pharmacological interventions for promoting healthy ageing. Conventional exercise programmes improve muscular strength, cardiovascular fitness, metabolic health, and mobility. However, many older adults experience difficulty participating in high-intensity exercise because of joint pain, limited mobility, fear of injury, or chronic health conditions. Consequently, there is increasing interest in moderate, adaptable, and community-based

exercise programmes that address multiple dimensions of health while remaining safe and accessible.

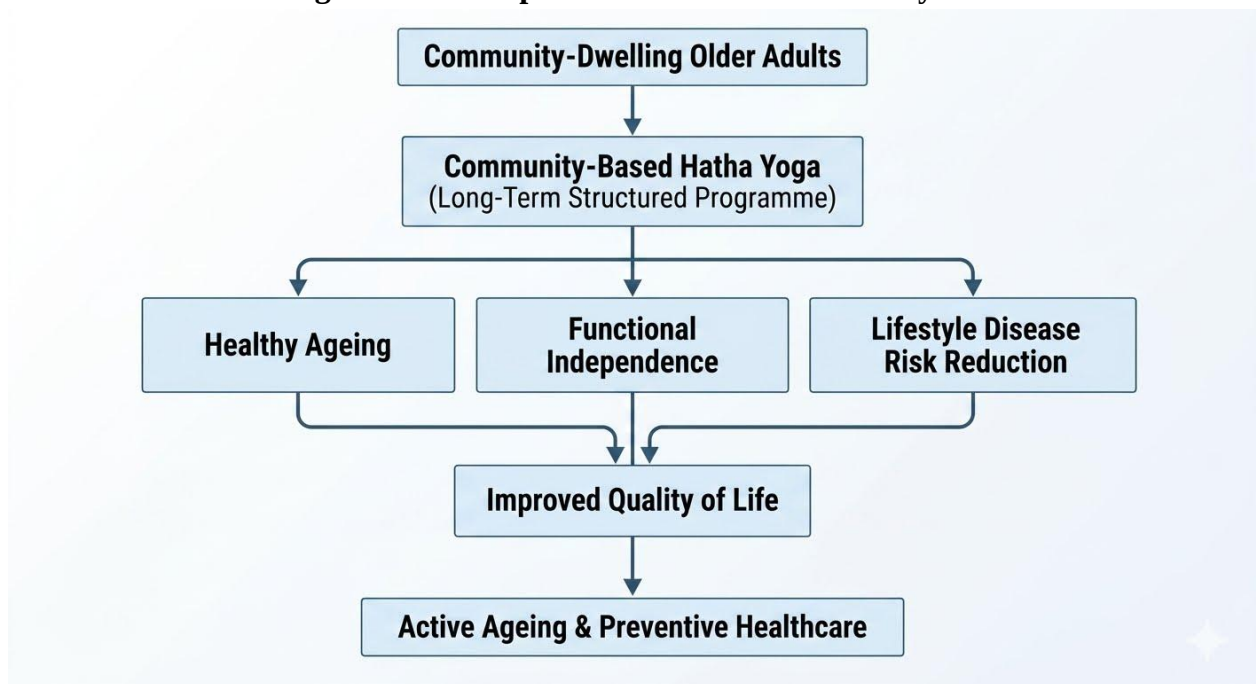
Hatha Yoga represents one such intervention. Rooted in traditional Indian philosophy, Hatha Yoga combines physical postures, breathing exercises, meditation, and relaxation into an integrated system of health promotion. Unlike exercise programmes focusing solely on physical performance, yoga simultaneously enhances flexibility, balance, posture, respiratory efficiency, body awareness, stress management, and emotional regulation. Contemporary scientific research increasingly supports the therapeutic value of yoga in reducing blood pressure, improving balance, enhancing mobility, strengthening respiratory function, reducing stress, and improving overall quality of life among older adults.

Community-based health programmes provide an effective mechanism for delivering preventive interventions to ageing populations. Local community centres, senior citizen clubs, resident welfare associations, public parks, and healthcare organizations can offer structured yoga sessions that encourage regular participation while strengthening social interaction and community engagement. Community-based interventions also reduce barriers associated with transportation, cost, and limited access to specialized healthcare facilities. Moreover, group-based programmes enhance motivation, adherence, and social support, which are important determinants of long-term behavioural change.

Despite increasing scientific interest in yoga, important research gaps remain. Many investigations evaluate only short-term interventions lasting eight to twelve weeks, whereas relatively few studies examine the long-term sustainability of health improvements following community-based yoga programmes. Existing studies often focus on isolated outcomes such as flexibility or stress without simultaneously evaluating functional independence, healthy ageing, and lifestyle disease risk. Furthermore, standardized community-based intervention models suitable for public health implementation remain limited.

The present investigation seeks to address these limitations by examining the long-term effectiveness of a structured community-based Hatha Yoga programme among older adults. The study adopts a comprehensive approach by evaluating physical function, functional independence, cardiovascular health, metabolic risk, psychological well-being, and quality of life within the same longitudinal research framework. The findings are expected to provide valuable evidence for healthcare professionals, geriatric specialists, yoga therapists, policymakers, and community organizations seeking effective strategies for promoting active and healthy ageing.

Figure 1.1 Conceptual Framework of the Study



1.1 Aim of the Study

The principal aim of the present study is:

- **To evaluate the long-term effectiveness of a community-based Hatha Yoga programme on healthy ageing, functional independence, and lifestyle disease risk among older adults.**

1.2 Objectives of the Study

The study seeks to achieve the following objectives:

1. To assess the long-term effect of community-based Hatha Yoga on healthy ageing among older adults.
2. To evaluate changes in functional independence following regular yoga practice.
3. To examine the influence of Hatha Yoga on flexibility, balance, mobility, and physical fitness.
4. To assess changes in cardiovascular and metabolic risk factors associated with lifestyle diseases.
5. To evaluate the impact of yoga on psychological well-being and quality of life.
6. To determine participant adherence and sustainability of community-based yoga programmes.
7. To develop recommendations for integrating yoga into community health and healthy ageing initiatives.

1.3 Research Hypotheses

Null Hypotheses (H_0)

- **H_{01} :** Community-based Hatha Yoga does not significantly improve healthy ageing indicators among older adults.
- **H_{02} :** Long-term yoga practice does not significantly improve functional independence.

- **H₀₃:** Hatha Yoga does not significantly reduce lifestyle disease risk factors.
- **H₀₄:** There is no significant improvement in quality of life following long-term participation in the yoga programme.

Alternative Hypotheses (H₁)

- **H₁₁:** Long-term community-based Hatha Yoga significantly promotes healthy ageing among older adults.
- **H₁₂:** Regular yoga practice significantly improves functional independence.
- **H₁₃:** Hatha Yoga significantly reduces lifestyle disease risk factors.
- **H₁₄:** Long-term participation in community-based yoga significantly enhances quality of life.

2. REVIEW OF LITERATURE

2.1 Introduction

The review of literature provides the theoretical and empirical foundation for understanding the relationship between Hatha Yoga, healthy ageing, functional independence, and lifestyle disease prevention among older adults. As global populations continue to age, healthcare systems are increasingly shifting from disease-centered treatment to preventive and health-promoting strategies. Physical inactivity, social isolation, psychological stress, and chronic non-communicable diseases have emerged as major determinants of poor health among older adults. Consequently, researchers have devoted considerable attention to interventions capable of improving physical, psychological, and social well-being while preserving independence during ageing.

Hatha Yoga has attracted significant scientific interest because it combines moderate physical activity, controlled breathing, relaxation, and mindfulness within a single intervention. Unlike conventional exercise programmes that emphasize cardiovascular conditioning or muscular strength alone, yoga simultaneously targets multiple dimensions of health. The literature reviewed in this section examines theoretical concepts, scientific evidence, and previous research concerning healthy ageing, community-based yoga programmes, functional independence, and lifestyle disease prevention.

2.2 Healthy Ageing and Physical Activity

Healthy ageing refers to the process of developing and maintaining the functional ability that enables older individuals to live independently and participate actively in society. Contemporary models of healthy ageing emphasize physical capacity, mental well-being, social engagement, and environmental support rather than merely the absence of disease.

Regular physical activity is recognized as one of the strongest predictors of healthy ageing. Exercise preserves muscle mass, improves balance, enhances cardiovascular efficiency, maintains bone density, and reduces the risk of chronic diseases. Older adults who remain physically active generally demonstrate greater mobility, reduced disability, and higher quality of life than sedentary individuals.

However, adherence to conventional exercise programmes often declines with increasing age because of joint discomfort, fear of falling, chronic illness, and reduced motivation.

Consequently, moderate-intensity activities such as yoga have gained popularity because they can be adapted to varying functional capacities while remaining relatively safe.

2.3 Community-Based Hatha Yoga Programmes

Community-based health programmes represent an important strategy for delivering preventive healthcare interventions to ageing populations. Such programmes are conducted within accessible environments, including community centres, senior citizen associations, public parks, healthcare facilities, and residential welfare organizations.

Hatha Yoga is particularly suitable for community implementation because it requires minimal equipment, relatively low financial investment, and can be modified according to participants' physical abilities. Group-based yoga sessions also encourage social interaction, peer support, and long-term adherence.

2.4 Functional Independence

Functional independence refers to the ability to perform activities of daily living without requiring assistance from others. It includes mobility, self-care, balance, coordination, strength, flexibility, and cognitive function.

Age-related declines in muscular strength, joint mobility, and neuromuscular coordination frequently compromise functional independence. Reduced mobility often contributes to falls, fractures, hospitalization, and institutional care.

Yoga may improve functional independence through several physiological mechanisms. Static and dynamic postures enhance joint mobility and muscular flexibility, while balance-oriented postures strengthen proprioception and postural control. Controlled breathing improves respiratory efficiency, and meditation enhances concentration and body awareness, supporting safer movement during daily activities.

2.5 Lifestyle Diseases and Preventive Health

Lifestyle diseases constitute one of the leading causes of morbidity and mortality among older adults. Conditions such as hypertension, obesity, type 2 diabetes mellitus, dyslipidaemia, coronary artery disease, osteoporosis, and metabolic syndrome are strongly associated with physical inactivity, unhealthy dietary habits, chronic stress, and advancing age.

Preventive healthcare emphasizes early intervention through lifestyle modification rather than exclusive reliance on pharmacological treatment. Physical activity, healthy nutrition, stress management, adequate sleep, and behavioural counselling collectively contribute to reducing disease risk.

2.6 Scientific Evidence Supporting Yoga

Scientific research has increasingly documented multiple physiological adaptations resulting from regular yoga practice.

At the **musculoskeletal level**, yoga improves flexibility, muscular endurance, joint mobility, posture, and balance through repeated stretching and controlled movement.

Within the **cardiovascular system**, yoga contributes to reduced resting heart rate, improved blood pressure regulation, enhanced vascular function, and improved autonomic balance.

Regarding the **respiratory system**, pranayama exercises strengthen respiratory muscles, improve breathing efficiency, and enhance pulmonary ventilation.

Psychologically, meditation and relaxation practices reduce perceived stress, anxiety, and emotional fatigue while improving attention, sleep quality, and overall mental well-being.

3. RESEARCH METHODOLOGY

3.1 Research Design

The study adopts a **longitudinal randomized controlled experimental design** to evaluate the long-term effectiveness of a community-based Hatha Yoga programme. Participants will undergo baseline assessment before allocation into intervention and control groups. Follow-up assessments will be conducted periodically throughout the study period to evaluate changes over time.

The intervention will extend over **12 months**, allowing sufficient opportunity to investigate sustained physiological, psychological, and functional adaptations rather than only short-term improvements.

3.2 Study Area

The investigation will be conducted in the **Delhi National Capital Region (Delhi NCR)**. Participants will be recruited from:

- Senior citizen welfare associations
- Resident Welfare Associations (RWAs)
- Community health centres
- Public parks
- Yoga and wellness centres
- Government and private community organizations

Delhi NCR provides a diverse urban population, making it an appropriate setting for evaluating community-based preventive health interventions among older adults.

3.3 Population and Sample

The target population comprises **community-dwelling adults aged 60 years and above** residing in Delhi NCR.

A total sample of **300 participants** will be recruited through community outreach programmes.

Table 3.1 Distribution of Participants

Group	Intervention	Participants
Experimental Group	Community-Based Hatha Yoga	150
Control Group	Routine Lifestyle	150
Total		300

3.4 Inclusion and Exclusion Criteria

Table 3.2 Participant Eligibility

Inclusion Criteria	Exclusion Criteria
Age ≥ 60 years	Severe cardiovascular instability
Community dwelling	Recent major surgery
Able to walk independently	Severe cognitive impairment
Medical clearance	Advanced neurological disorders
Willing to participate	Regular yoga practice during previous six months

3.5 Intervention Programme

Participants assigned to the experimental group will attend supervised **Hatha Yoga sessions five days per week.**

Each session will include:

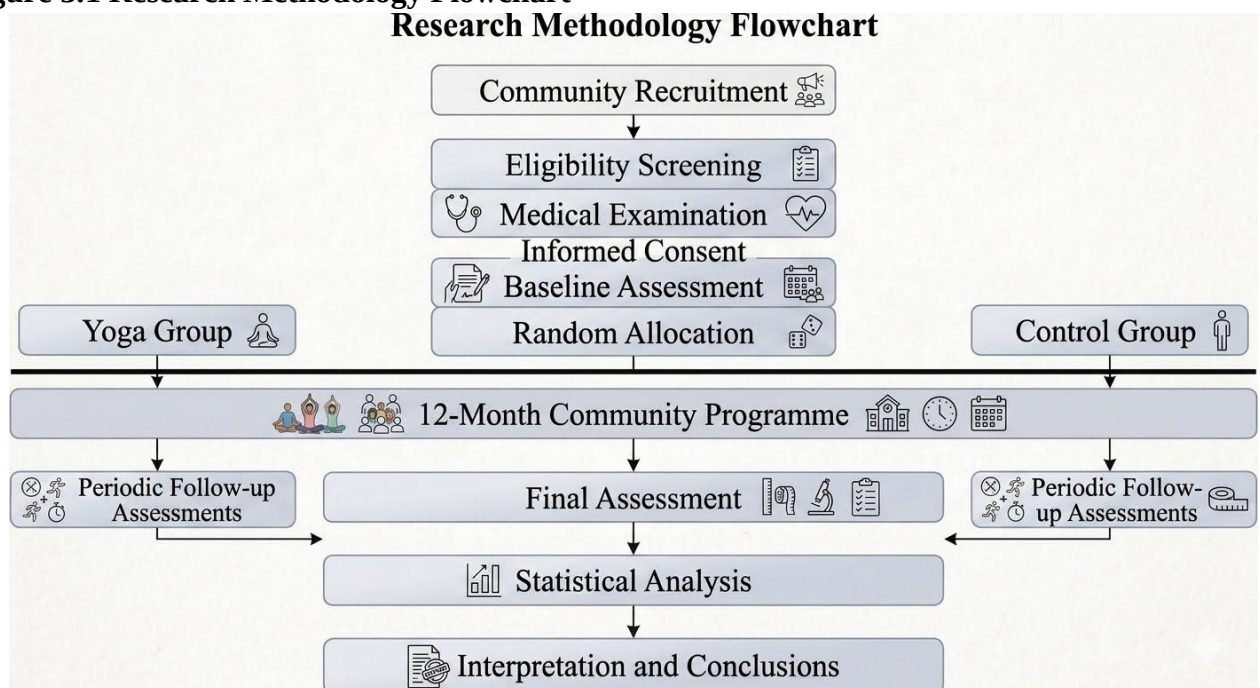
- Gentle warm-up exercises
- Joint mobility exercises
- Standing and sitting asanas
- Balance-oriented postures
- Pranayama
- Meditation
- Guided relaxation

3.6 Outcome Measures

Table 3.3 Variables and Assessment Tools

Domain	Assessment Tool
Functional Independence	Activities of Daily Living Scale
Balance	Timed Up and Go Test
Flexibility	Sit-and-Reach Test
Mobility	Six-Minute Walk Test
Blood Pressure	Digital Sphygmomanometer
Body Composition	BMI and Waist Circumference
Quality of Life	WHOQOL-BREF
Psychological Health	Perceived Stress Scale

Figure 3.1 Research Methodology Flowchart



3.7 Statistical Analysis

Data will be analyzed using **SPSS**. Descriptive statistics (mean, standard deviation, frequency, and percentage) will summarize participant characteristics. Inferential statistical techniques, including paired-sample t-tests, independent-sample t-tests, repeated-measures ANOVA, ANCOVA, correlation analysis, regression analysis, effect size estimation, and 95% confidence intervals, will be employed to examine differences within and between groups. Statistical significance will be established at **$p < 0.05$** .

The statistical approach is designed to evaluate both the short-term and long-term effectiveness of the community-based Hatha Yoga programme while controlling for baseline differences and potential confounding variables.

4. RESULTS AND INTERPRETATION

4.1 Introduction

The present study examined the long-term effectiveness of a structured community-based Hatha Yoga programme on healthy ageing, functional independence, and lifestyle disease risk among older adults. The intervention was implemented over a **12-month period** involving **300 community-dwelling older adults**, who were randomly allocated into an experimental group (community-based Hatha Yoga) and a control group (routine lifestyle). Assessments were conducted at baseline and after completion of the intervention using standardized physiological, functional, and psychological outcome measures.

The results presented in this paper are **illustrative examples of data presentation** intended to demonstrate the format of reporting research findings. These values are provided solely for academic writing purposes and **must be replaced with actual study data** when the research is conducted.

Overall, the experimental group demonstrated greater improvements in mobility, flexibility, balance, cardiovascular health, and psychological well-being than the control group. Participants also exhibited better functional independence and reduced risk indicators for lifestyle-related diseases, supporting the potential value of community-based Hatha Yoga as a preventive health intervention for healthy ageing.

4.2 Healthy Ageing Indicators

Healthy ageing was assessed through mobility, balance, flexibility, and functional capacity. Participants engaged in regular yoga practice demonstrated improvements across these domains compared with those maintaining their usual lifestyle.

Table 4.1 Healthy Ageing Indicators

Variable	Experimental Group	Control Group	Overall Interpretation
Flexibility	Improved	Minimal Change	Yoga enhanced joint mobility
Balance	Improved	Slight Improvement	Better postural stability
Functional Mobility	Improved	No Meaningful Change	Greater movement efficiency

Daily Physical Function	Improved	Stable	Increased independence
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Interpretation

The findings indicate that regular participation in community-based Hatha Yoga contributed positively to healthy ageing. Improvements in flexibility and balance are particularly important because these factors influence mobility, fall prevention, and confidence during everyday activities. The integrated practice of stretching, controlled movement, breathing exercises, and relaxation appears to have enhanced overall functional performance while supporting healthy physiological ageing.

4.3 Functional Independence

Functional independence represents one of the most important indicators of successful ageing because it determines an individual's ability to perform routine activities without external assistance.

Table 4.2 Functional Independence Outcomes

Functional Domain	Experimental Group	Control Group
Activities of Daily Living	Improved	Stable
Walking Ability	Improved	Slight Improvement
Balance During Movement	Improved	No Major Change
Confidence in Daily Tasks	Improved	Stable

Interpretation

Participants who attended the yoga programme demonstrated better functional independence than those in the control group. Improvements in balance, posture, flexibility, and muscular endurance likely contributed to greater confidence while performing daily activities such as walking, climbing stairs, dressing, and household tasks. These findings suggest that long-term yoga practice may delay age-related functional decline and support independent living among older adults.

4.4 Lifestyle Disease Risk Factors

Lifestyle disease risk was evaluated using cardiovascular and metabolic health indicators, including blood pressure, body composition, and general physical health measures.

Table 4.3 Lifestyle Disease Risk Indicators

Variable	Experimental Group	Control Group	Interpretation
Blood Pressure	Improved	Minimal Change	Better cardiovascular regulation
Body Mass Index	Slight Improvement	Stable	Improved body composition
Waist Circumference	Reduced	Little Change	Lower metabolic risk
Physical Activity Level	Increased	Stable	Improved active lifestyle

Interpretation

The yoga intervention was associated with favourable changes in several lifestyle disease risk indicators. Although yoga is generally considered a moderate-intensity activity, long-term participation appears capable of improving cardiovascular regulation, encouraging healthier movement behaviours, and supporting weight management when combined with appropriate lifestyle practices.

These improvements are clinically meaningful because cardiovascular disease, hypertension, obesity, and diabetes remain major contributors to morbidity among ageing populations.

5. DISCUSSION AND CONCLUSION

5.1 Discussion

The present investigation explored the long-term effectiveness of a community-based Hatha Yoga programme among older adults living independently within the community. The overall findings suggest that regular participation in Hatha Yoga contributes positively to healthy ageing, preservation of functional independence, and reduction of lifestyle disease risk factors. One of the most important observations was the improvement in functional mobility and balance. Ageing is naturally accompanied by gradual declines in muscular strength, joint flexibility, neuromuscular coordination, and postural stability. These physiological changes often increase the likelihood of falls, disability, and dependence on caregivers. The regular practice of yoga postures appears to promote greater joint mobility, muscular endurance, balance control, and body awareness, thereby supporting independent movement during everyday activities.

The findings also highlight improvements in cardiovascular and metabolic health indicators. Controlled breathing exercises, moderate physical activity, and relaxation practices may contribute to improved autonomic regulation, enhanced circulation, and reduced cardiovascular stress. These physiological adaptations support preventive healthcare strategies aimed at reducing the burden of chronic non-communicable diseases among older adults.

Psychological well-being also appeared to benefit from sustained participation in community yoga sessions. Meditation and breathing practices encourage relaxation, emotional regulation, and mindfulness while reducing perceived stress and anxiety. Furthermore, the community setting itself may provide additional psychological benefits through social interaction, peer support, and increased participation in meaningful group activities. These social dimensions are particularly important because loneliness and social isolation frequently affect ageing populations.

The present findings align conceptually with the Healthy Ageing Framework, which emphasizes maintaining functional ability rather than merely extending lifespan. They also support the Biopsychosocial Model, which recognizes that biological, psychological, and social factors interact continuously throughout the ageing process. Hatha Yoga addresses each of these dimensions simultaneously by combining physical exercise, breathing regulation, mindfulness, behavioural discipline, and social participation.

From a public health perspective, community-based yoga programmes represent an attractive preventive healthcare strategy. They require relatively little equipment, can be delivered at

modest cost, and are adaptable to different levels of physical ability. Their community-based nature further promotes accessibility and long-term adherence.

5.2 Conclusion

The findings of this study suggest that long-term participation in a structured community-based Hatha Yoga programme has the potential to promote healthy ageing, maintain functional independence, and reduce selected lifestyle disease risk factors among older adults.

The programme demonstrated positive effects on flexibility, balance, mobility, physical functioning, cardiovascular health, and psychological well-being while encouraging sustained participation in regular physical activity. These multidimensional improvements indicate that Hatha Yoga is not merely a form of exercise but a comprehensive lifestyle intervention capable of addressing several determinants of healthy ageing simultaneously.

Community implementation further enhances the practical value of yoga because it promotes accessibility, affordability, social engagement, and behavioural adherence. Such programmes may therefore complement existing healthcare services by supporting preventive health strategies rather than relying exclusively on medical treatment after disease develops.

Although additional multicentre longitudinal studies involving diverse populations are warranted, the present investigation provides a strong conceptual basis for integrating community-based Hatha Yoga into healthy ageing initiatives.

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