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ORIGINAL ARTICLE

# CARDIOVASCULAR ENDURANCE AMONG COMMUNITY-DWELLING ELDERLY POPULATION WITH OA KNEE - CROSS-SECTIONAL STUDY

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## ABSTRACT:

**Background:** Cardiorespiratory fitness is the ability of circulatory and respiratory systems to supply oxygen to skeletal muscles and utilize it during physical activity. With the ageing population, there is a greater prevalence of osteoarthritis and decreased aerobic capacity after 65. Hence the purpose of this study is to evaluate cardiovascular endurance among the elderly with OA knee. **Methods:** 2 min walk test was performed over 30m courses. Distance covered by the subject was recorded. The rest period of 10 min was given, and the test was repeated. The one in which more distance is covered was taken as the final result. **Result:** Recorded values of cardiovascular endurance in both OA knee individuals are less than normal values, and it is reduced in bilateral than unilateral. **Conclusion:** Cardiovascular endurance is reduced in bilateral OA knee individuals than unilateral.

**Keywords:** 2 min walk test, aerobic capacity, bilateral, unilateral, arthritis, oxygen uptake.

## INTRODUCTION:

Cardiorespiratory fitness refers to the ability of circulatory and respiratory systems to supply oxygen to skeletal muscles and the power of the skeletal muscles to utilize the oxygen during prolonged moderate-to-vigorous physical activity. [(1)] Diseases of the cardiovascular system are the number 1 cause of mortality and morbidity globally and will continue to be for years to come. [(2)]Reduced CV endurance increases the risk of hypertension, obesity( hence the increased risk of osteoarthritis), diabetes, and coronary, cerebral, and peripheral vascular diseases in various populations. [(3)] [(4)] Therefore, many have recommended including CVE testing to screen for cardiovascular diseases and their risk factors. [(5)] [(6)]

Cardiorespiratory fitness decreases with ageing. [(7)] [(8)] With the ageing population, there is a greater prevalence of chronic arthritis syndromes, particularly osteoarthritis. [(9)] Patients with chronic arthritis are more likely to be obese[(10)(11)] and have more impairments of aerobic capacity than normal subjects[(12-14)]. After reaching 30, ageing leads to a progressive loss of muscular strength, muscular endurance, joint flexibility and balance [(15-17)] Age-induced musculoskeletal fitness loss may inhibit older people from performing basic functional tasks forex lifting and moving objects, rising from a chair, and walking. Therefore, Musculoskeletal Fitness (MSF) is an essential determinant of one's capability to manage daily life activities and maintain functional independence [(18-20)].

The cardiorespiratory system is also susceptible to change, and a significant decrease in aerobic capacity has been found after 40 years. At the age of 65 years, it has approximately 30% less aerobic capacity [(21)]. Effective approaches for older people to maintain a healthy and active life are urgently needed. The elderly have twice as many disabilities and four times as many physical limitations as people less than 60 years of age [(22)].

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The capacity for elderly individuals to undertake aerobic activities such as walking and running is adversely affected by advancing age due to the decline in maximal oxygen uptake of about 0.5%–1.0% per year. Cardiorespiratory fitness (aerobic capacity) decreases with ageing, and population-based reference values for different age groups are needed to help professionals evaluate an individual's fitness level better. Tests have been designed specifically for the elderly and adjusted to older people. Previous studies have shown that patients with chronic osteoarthritis (OA) and rheumatoid arthritis have impaired aerobic capacity.

Hence the purpose of my study is to evaluate cardiovascular among the community-dwelling elderly population with OA knee.

**PROCEDURE:**

This was an Observational, Cross-sectional study, with a study duration of 03 months. A total of 20 elderly (OA knee) individuals of age group (60-75) were recruited using the purposive sampling method. Using the formula n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)] for the measurement of sample size. Ethical committee approval was obtained before the commencement of the study. The study material used was cone markers, measuring tape, stopwatch and weighing machine. The inclusion criteria was both males and females of 60-75 years with unilateral and bilateral OA knee diagnosed according to ACR criteria and willing to participate. At the same time, the exclusion criteria were individuals with a recent injury or systemic illness, lower limb amputated individuals, uncooperative patients, patients with recent surgery and any musculoskeletal deformity. After explaining the importance of the study, when a participant agreed to participate in the study, a verbal and written informed consent form in Marathi was obtained from all the participants. The height and weight of all individuals were taken, and BMI was calculated, and the cardiovascular endurance of all participants with OA was assessed by using 2 min walk test. The 2 min walk test is a simple measure of the distance a person can walk in two minutes. Rest breaks are allowed if needed. Walking aids can be used as needed. The test will be performed over a 15m out-and-back course and marked with cones on both sides. The subject is asked to walk back and forth around the cones and permitted to slow down, stop and rest as necessary. A rest period of 10min will be given to the subject, and the test will be repeated. Out of the two trials, the one in which more distance covered was taken as the final result.

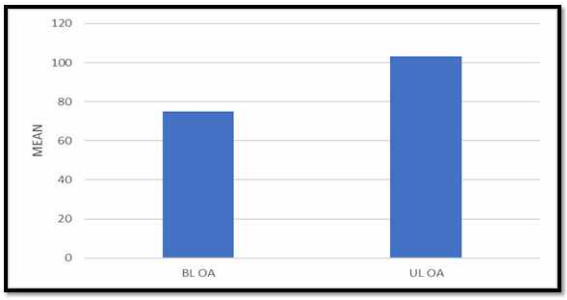
**Fig 1:** Patient performing 2 min walk test

**Fig 2:** Weight measurement

**Fig 3:** Height measurement

| UL OA knee (Mean±SD) | BL OA knee (Mean±SD) | P-Value | Result |
|---|---|---|---|
| 103.27±20.34 | 75±15 | 0.0177 | Significant |

The result is considered significant as (P-value is 0.0177)

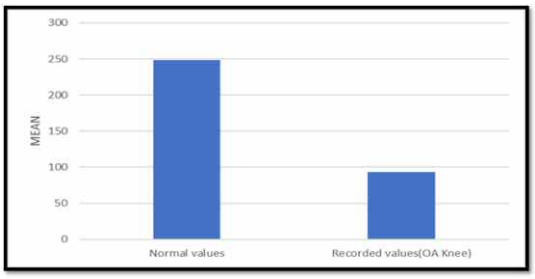



**Graph 1: -** Showing comparison between UL and BL OA knee individuals.

**Table No. 2:** Comparing average values and recorded values (OA knee) in elderly individuals.

| Average values (Mean±SD) | Recorded values (Mean±SD) | P-Value | Result |
|---|---|---|---|
| 248.708±13.74 | 93.38±22.88 | 0.0001 | Extremely significant |

The result is considered highly significant as (P-value is 0.0001)




**Graph 2: -** Showing comparison between normal values and recorded values (OA knee) individuals.

Table no. 1 mean values of cardiovascular endurance for unilateral and bilateral OA knee individuals are (103.27±20.34) (75±15), respectively, and the comparison between those individuals is considered significant (p-value-0.0177). Comparing average and recorded values (OA knee) of cardiovascular endurance is considered highly substantial (p-value- 0.0001).

In Table no.2, the table depicts the comparison between expected values and recorded values (OA knee) in elderly individuals. The comparison of recorded values was made by comparing them with average values; the results were showing highly significant p-value-0.0001) values as mean and SD of average values and recorded values were (248.708±13.74), ( 93.38±22.88), respectively.

**DISCUSSION:**

The present study was conducted on cardiovascular endurance in the community-dwelling elderly population with OA knee. The cardiovascular endurance was measured using 2 min walk test on 30 m (to and fro) distance. The current study states that cardiovascular endurance is reduced in bilateral OA knee individuals than unilateral, as shown in table no. 2. Recorded values of cardiovascular endurance in bilateral and unilateral OA knee individuals are less than average values, as shown in table no. 3

The result showed that cardiovascular endurance is reduced overall in elderly OA knee individuals and bilateral than unilateral OA knee. This is due to decreased cardiac output, decreased respiratory ability of the lungs, muscle atrophy. This results in an overall reduction in the physical fitness of elderly individuals. Patients with knee OA have a 15–20% decrease in aerobic capacity.

This result is consistent with the study conducted by the author Leena Hakola in 2015 calculated maximum oxygen consumption (VO2max) to evaluate cardiorespiratory fitness. They found that the rate of VO2max decline with age was slightly more significant in the present study. The decline in VO2max with age is likely to decrease in maximal heart rate, stroke volume, maximal cardiac output, lean body mass, and possibly a reduction in muscle oxidative capacity and decline in performance with ageing.

The study conducted by I N Arshinta et al. In 2017 used 6 min walk test to evaluate cardiovascular endurance in 33 elderly individuals. The results show that as many as 63.60% of elderly dementia patients had poor cardiorespiratory endurance. Decreased cardiovascular endurance in the elderly due to ageing is caused by decreased cardiac output, reduced perfusion ability of the peripheral tissue, decreased respiration ability of the lungs, muscle atrophy, and reduced power of muscle contraction

In the study carried out by EDWARD F. PHILBIN et al., the noninvasive cardiopulmonary assessment was performed during exercise using a CPX-MAX metabolic cart that analyses inspiratory and expiratory gases breath-by-breath basis to determine the rate of oxygen consumption (peak VO2). The results of this study demonstrate severe cardiovascular deconditioning due to end-stage OA of the lower extremities, which is similar to the results found in our research.

The study conducted by Geraldo A. Maranh˜ao Neto et al. Evaluated cardiorespiratory fitness (CRF) utilizing the Rating of Perceived Capacity scale in the elderly (aged 60 to 90 yrs.). The subject chooses the most strenuous activity that can be sustained for at least 30min. The RPC score is expressed in METs, and the listed activities include walking, jogging, running, and cycling at different paces. Their result was considered significant. They have concluded that there is a negative effect of ageing on CRF.

**CONCLUSION**:

From the study, we found cardiovascular endurance (by 2MWT) in the community-dwelling elderly population with OA knee. The results stated that cardiovascular endurance is reduced in bilateral OA knee individuals than unilateral. Recorded values of cardiovascular endurance in bilateral and unilateral OA knee individuals are less than average values.

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**Conflict of Interest**: None

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**REFERENCES:**

1. Ferguson B. ACSM's guidelines for exercise testing and prescription 9th Ed. 2014. The Journal of the Canadian Chiropractic Association. 2014 Sep;58(3):328.
2. Braunwald E. Cardiovascular medicine at the turn of the millennium: triumphs, concerns, and opportunities. New England Journal of Medicine. 1997 Nov 6;337(19):1360-9.
3. Brien SE, Janssen I, Katzmarzyk PT. Cardiorespiratory fitness and metabolic syndrome: US National Health and Nutrition Examination Survey 1999–2002. Applied physiology, nutrition, and metabolism. 2007 Feb;32(1):143-7.
4. Lee DC, Artero EG, Sui X, Blair SN. Mortality trends in the general population: the importance of cardiorespiratory fitness. Journal of psychopharmacology. 2010 Nov;24(4_suppl):27-35.

5. Balady GJ, Larson MG, Vasan RS, Leip EP, O'Donnell CJ, Levy D. Usefulness of exercise testing to predict coronary disease risk among asymptomatic persons as a function of the Framingham risk score. Circulation. 2004 Oct 5;110(14):1920-5.

6. Fowler-Brown A, Pignone M, Pletcher M, Tice JA, Sutton SF, Lohr KN. Exercise tolerance testing to screen for coronary heart disease: a systematic review for the technical support for the US Preventive Services Task Force. Annals of internal medicine. 2004 Apr 6;140(7): W-9.

7. Fleg JL, Morrell CH, Bos AG, Brant LJ, Talbot LA, Wright JG, Lakatta EG. The accelerated longitudinal decline of aerobic capacity in healthy older adults. Circulation. 2005 Aug 2;112(5):674-82.

8. Shvartz E, Reibold RC. Aerobic fitness norms for males and females aged 6 to 75 years: a review. Aviation, space, and environmental medicine. 1990 Jan 1;61(1):3-11.

9. Epstein WV, Yelin EH, Nevitt M, Kramer JS. Arthritis: a major health problem of the elderly. Arthritis and the elderly. New York: Springer. 1986:5-17.

10. Leach RE, Baumcard S, Broom J. Obesity: its relationship to osteoarthritis of the knee. Clinical Orthopaedics and Related Research (1976-2007). 1973 Jun 1; 93:271-3.

11. Felson DT, Zhang Y, Anthony JM, Naimark A, Anderson JJ. Weight loss reduces the risk for symptomatic knee osteoarthritis in women: the Framingham Study. Annals of internal medicine. 1992 Apr 1;116(7):535-9.

12. Minor MA, Hewett JE, Webel RR, Dreisinger TE, Kay DR. Exercise tolerance and disease-related measures in rheumatoid arthritis and osteoarthritis patients. The Journal of rheumatology. 1988 Jun 1;15(6):905-11.

13. Beals CA, Lampman RM, Banwell BF, Braunstein EM, Albers JW, Castor CW. Measurement of exercise tolerance in patients with rheumatoid arthritis and osteoarthritis. The Journal of rheumatology. 1985 Jun 1;12(3):458-61.

14. Ekblom B, Lövgren O, Alderin M, Fridström M, Sätterström G. Physical performance in patients with rheumatoid arthritis. Scandinavian Journal of Rheumatology. 1974 Jan 1;3(3):121-5.

15. Spirduso WW. Physical dimensions of ageing. 1st ed. USA, IL: Human Kinetics; 1995.

16. Doherty TJ. Invited review: Aging and sarcopenia. J Appl Physiol. 2003;95(4):1717–27

17. Todd C, Skelton DA. What are the main risk factors for falls amongst older people, and what are the most effective interventions to prevent these falls? How should interventions prevent falls be implemented?.