World Journal of Pharmaceutical and Life Sciences
WJPLS
www.wjpls.org
SJIF Impact Factor: 7.409

AN EXPLORATION OF LOCOMOTOR SYNDROME AMONG GERIATRIC POPULATION - A NARRATIVE REVIEW

Kamalesh Shanmuganathan*[1], Ezhil Mangai Kannappan[2], S. Kalpana[3], Jasmine S. Sundar[3], S. Valarmathi[3] and G. Srinivas[3]

[1]Public Health PG Student, Department of Epidemiology, The Tamilnadu Dr MGR Medical University, Guindy, Chennai, Tamilnadu, India 600032.
[2]Epidemiology PG Student, Department of Epidemiology, The Tamilnadu Dr MGR Medical University, Guindy, Chennai, Tamilnadu, India 600032.
[3]Department of Epidemiology, The Tamilnadu Dr MGR Medical University, Guindy, Chennai, Tamilnadu, India 600032.

***Corresponding Author: Kamalesh Shanmuganathan**
Public Health PG Student, Department of Epidemiology, The Tamilnadu Dr MGR Medical University, Guindy, Chennai, Tamilnadu, India 600032.

Article Received on 07/06/2024 **Article Revised on 28/06/2024** **Article Accepted on 18/07/2024**

ABSTRACT

Background: A locomotor disability in the geriatric population is a physical condition that impairs mobility and movement in older persons. It is frequently caused by age-related causes such as degenerative diseases, osteoarthritis, or neurological abnormalities. This impairment can have a substantial influence on older people's quality of life by limiting their ability to conduct daily activities independently, such as walking, standing, or climbing stairs. Addressing locomotor impairments in older persons is critical for preserving their mobility, independence, and overall well-being, ultimately improving their quality of life as they age. **Methods:** A comprehensive literature search was conducted, which were sourced from PubMed, google scholar, Japanese government websites, springer link, semantic scholar generated significant studies using the keywords like locomotor disability, older population, mobility, quality of life, aging. We included articles which were published from 2005-2024. **Results:** Locomotive Syndrome (LS) affects a significant portion of the elderly population, with prevalence ranging from 8.4% to 50.3%, increasing with age and higher in women. It shows the correlations with osteoporosis and sarcopenia, suggesting potential shared risk factors or pathways. By this the older people tend to have lower quality of life, particularly concerning spinal alignment and trunk deformity. Exercise interventions, including locomotive training, aerobic exercise, and muscle training, are suggested for LS prevention. Vitamin D supplementation may benefit bone health and fall prevention in older individuals. **Conclusion:** Locomotor syndrome is a substantial concern, especially in ageing populations, with considerable implications for quality of life. Its prevalence, which is frequently associated with osteoporosis and sarcopenia, highlights the necessity of preventive measures including exercise and vitamin D supplementation. Recognising the impact of LS on mobility and well-being is critical for establishing focused interventions to prevent and manage its progression, thereby improving the overall health and independence of geriatric population.

KEYWORDS: Geriatric Population, Locomotive Syndrome, Aging, Mobility, Quality of Life, Exercise, Intervention.

INTRODUCTION

The concept of "locomotive syndrome," coined by the Japanese Orthopaedic Association (JOA) in 2007 to address mobility issues stemming from musculoskeletal decline in the aging population, remains primarily focused within Japan and has not gained global recognition.[1]

The locomotor system is primarily accountable for facilitating movement. Clinical approaches concerning locomotor systems have evolved in the past 4 decades due to the increased occurrence of chronic locomotive organ ailments in individuals aged middle to elderly.[2] The locomotor system, crucial for mobility, has seen a notable rise in the necessity for surgical intervention to address chronic diseases, particularly among individuals aged 50 and above.[3] The average Japanese life expectancy in 2014 was 80.5 years for men and 86.8 years for women, up from the previous year. The number of Japanese citizens aged 65 and up in 2014 was 33

million (26.7% of the total population), the highest ever recorded anywhere in the world. This number is predicted to reach 36.57 million (30.3%) by 2025.[4]

This increased life expectancy has had an impact on many facets of daily life for the elderly, one of which is difficulties moving around. This is illustrated by a study in Kagoshima, which demonstrated that issues such as fear of falling (81.7%), not being able to stand without arm support (81.1%), not being able to ascend stairs without using rail or wall for support (81.3%), slow gait speed (71.7%), and refraining from going out (50%) were common among people aged 70-74 years.[5] Difficulty with independent mobility is a risk factor for hospital discharge delays, and motor impairments account for 35.1% of discharge planning complications. This figure is substantially higher than malignant disease (16.2%), which is the second most prevalent cause of problematic hospital discharge.[6]

SEARCH CRITERIA

The keywords used to search were "locomotor syndrome", "geriatric population", "older adults", "elderly mobility", "physical function", "balance impairment", "frailty", "quality of life". Boolean operators like 'AND', 'OR' used to find articles that contain all the terms. Since, locomotor and geriatric research contains lot of studies, but here we prioritizing the studies from 2005-2024. Focused on peer review article, systematic review, literature reviews, articles from government journals and study designs such as cohort, cross sectional and interventional studies.

LOCOMOTIVE SYNDROME COMPARED WITH FRAILTY

The term 'frailty' refers to elderly persons who are at high risk of mortality, disability, or institutionalisation. The terms are similar, but LS is defined as physical frailty with musculoskeletal disease rather than social or cognitive frailty.

Sarcopenia is a subset of locomotive syndrome, and both share the themes of poor physical performance and delayed gait. In elderly persons with frailty, LS and sarcopenia are more likely the results of a permanent breakdown of homeostasis.

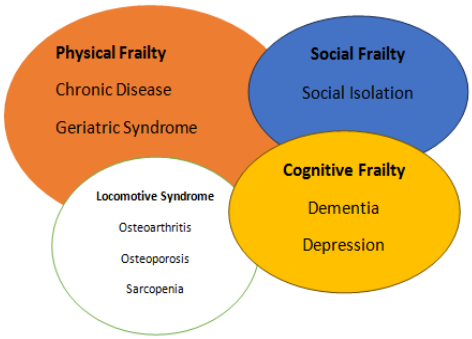


Fig 1: Relationship between frailty and locomotive syndrome.

PREVALENCE OF LOCOMOTIVE SYNDROME

A prior study comprised 135 patients aged 70 years or older[7] and identified 50.3% as having Locomotive syndrome (LS) using Loco-Check. Another study with 722 participants aged 56.6 years on average discovered 56 of 264 (21.2%) males and 165 of 463 (35.6%) women were categorised as LS using criteria set by Loco-check.[8] Other investigations utilising GLFS-25 or GLFS-5 (Geriatric Locomotive Function Scale-25) for screening of LS indicated that the prevalence of LS in patients aged 70 years is approximately 16% (7,9-11). A major cross-sectional internet survey was carried out utilising the GLFS-25. This study aimed to assess the prevalence of LS in Japan. Among the 4500 survey participants, those in their 70s had a considerably higher mean GLFS-25 value than the other age groups. The LS as determined by this test was significantly higher in women (12.3%) than in men (7.9%). The study found that the prevalence of LS was 8.4% in those aged 40, 9.2% in those aged 50, 8.3% in those aged 60, and 16.3% in those aged 70. This study estimated that approximately 6.5 million people in Japan have LS.[9]

The prevalence of LS was found to be considerably higher in women than in males, and it tended to rise substantially beyond the age of 70. In participants who were 70 years of age or older, the prevalence was found to be between 16% and 17% when using the GLFS-25 or GLFS-5. We may anticipate that the use of physical functioning tests and other novel screening techniques will become more common in the future, and that these tests will help us determine the prevalence of LS. Because the screening test chosen may have an impact on the prevalence, clinicians should exercise caution when choosing which tests to utilise.

OSTEOPOROSIS

There is a relationship between LS and osteoporosis[10,11] Using quantitative ultrasound (QUS) methods, the percentage of young adult mean (%YAM) of the speed of sound was shown to be considerably lower in 43 patients with LS as determined by the GLFS-25 than in 244 subjects without LS (68% vs. 78%)[10] When the severity of LS increases, the prevalence of osteoporosis detected by QUS techniques rises (32.5% vs. 57.9%)[12] However, instead of utilising dual-energy X-ray absorption (DXA), which is the gold standard for diagnosing osteoporosis, all investigations assessed bone mass using QUS. Therefore, it is unclear to what extent LS suggests low bone mass. But, because greater QUS readings indicate a higher risk of fracture, people who were diagnosed with LS may also have low bone mass.[13]

SARCOPENIA

Two studies have a relationship between LS and sarcopenia.[12,14] According to a study, individuals with sarcopenia were more likely to have LS, as determined by loco-check, and they also had lower body mass index and calf circumference. Multivariate research revealed a

substantial correlation between LS and sarcopenia[14] A further study found that 15.8% of older persons with LS also had sarcopenia; however, the multivariate analysis that took age and sex into account did not find a connection between LS and sarcopenia.[12]

Since both studies used a cross-sectional design, sarcopenia has a substantial correlation with age and sex, but sarcopenia does not have a clear cause-and-effect relationship with LS.

QUALITY OF LIFE (QOL)

According to a study a population identified as having LS through the application of Loco-check also had a lower quality of life connected to their health. A finding of LS based on Loco-check is strongly associated with both the Euro QOL-VAS (Quality of Life-Visual Analog Scale) score and the Euro QOL-5D utility value.[15] A poorer quality of life (QOL) score is linked to worse spinal alignment, such as trunk deformity.[16]

The term "locomotive dysfunction" was used to describe LS because musculoskeletal disorders, particularly those affecting the spine and lower extremities, impair gait function and thus reduce social activities in older persons.

PREVENTING LOCOMOTIVE SYNDROME

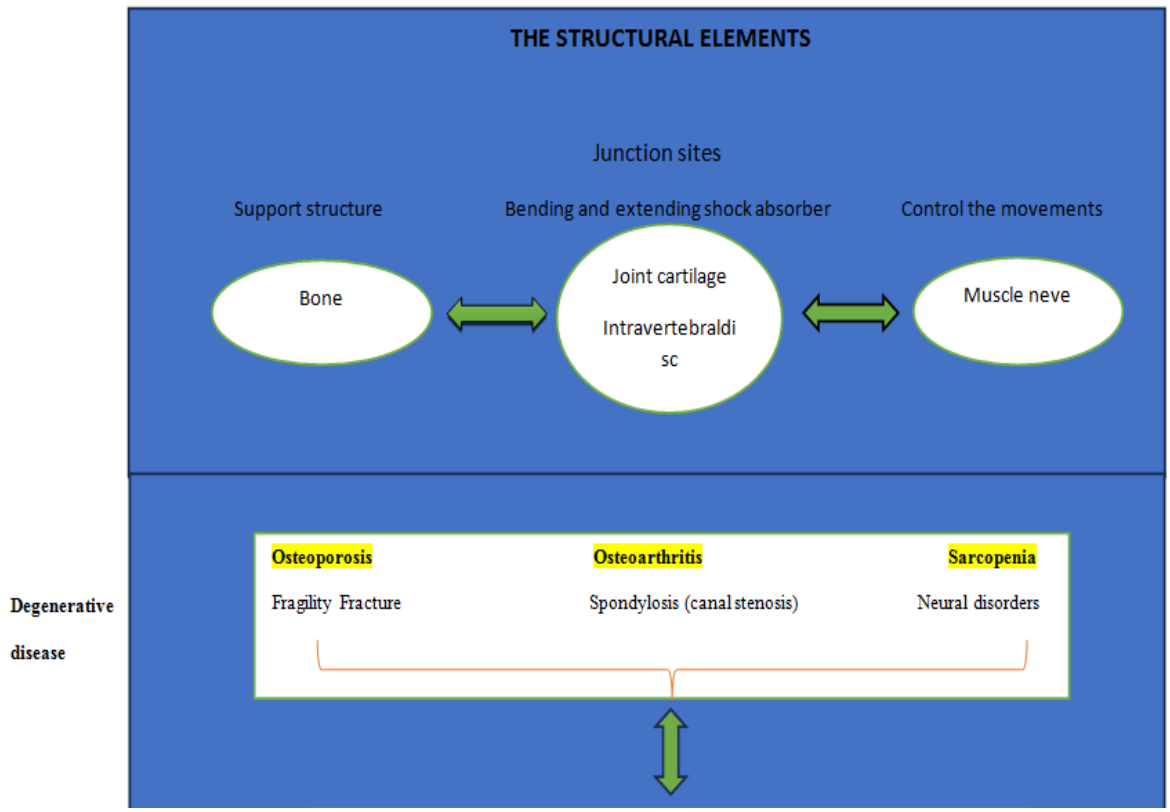
For older persons with reduced locomotive dysfunction due to musculoskeletal issues, LS is a comprehensive concept. Medications, pain management, and maintaining bone strength may be necessary to treat the primary musculoskeletal condition that LS patients experience.

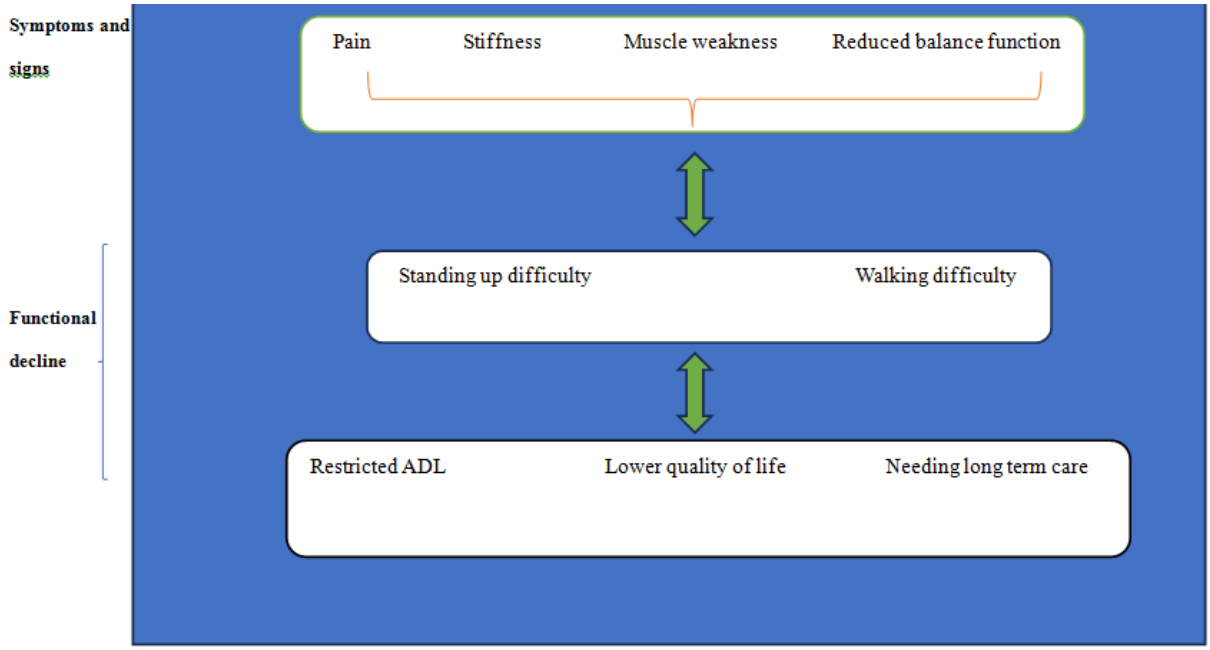
Exercise intervention has often been suggested as a means of preventing LS. For elderly individuals with LS, locomotive training (Loco-Tre)—which includes squats and one-leg standing exercises—may help to enhance muscle strength and balance[17] One-leg standing is a common exercise used to improve balance and prevent falls[18] 69.3% of participants in the two-month period adhered to these exercises.[19] This is an easy-to-understand exercise that can help with compliance for older persons.

Aerobic exercise is advised to help people lose weight if they are middle-aged and have LS due to a metabolic disease[20] stated In people with greater BMIs, loco-tre intervention did not enhance physical measures. In contrast, we discovered that those with LS had a greater frequency of osteoporosis than those without[12] For each type of LS, we advise prescribing appropriate exercise. Aerobic activity is advised to lower and regulate body weight, while muscle training is advised to maintain bone and muscle mass. Vitamin D may also be required to keep bones strong and lower the chance of falling. While exercise and vitamin D supplements are advised to help older persons avoid falling.[21]

As complete care is required to prevent or improve LS, we advise that exercise be recommended depending on the results of an assessment of the type of LS.

CONCEPTUAL FRAMEWORK OF THE LOCOMOTIVE SYNDROME





CONCLUSION

Locomotive syndrome is a substantial concern, especially in ageing populations, with considerable implications for quality of life. Its prevalence, which is frequently associated with osteoporosis and sarcopenia, highlights the necessity of preventive measures including exercise and vitamin D supplementation. Recognising the impact of LS on mobility and well-being is critical for establishing focused interventions to prevent and manage its progression, thereby improving the overall health and independence of geriatric population.

REFERENCE

1. Yurube T, Ito M, Takeoka T, Watanabe N, Inaoka H, Kakutani K, et al. Possible Improvement of the Sagittal Spinopelvic Alignment and Balance through "Locomotion Training" Exercises in Patients with "Locomotive Syndrome": A Literature Review. Adv Orthop, 2019; 2019: 6496901.
2. Yoshimura N, Muraki S, Oka H, Mabuchi A, En-Yo Y, Yoshida M, et al. Prevalence of knee osteoarthritis, lumbar spondylosis, and osteoporosis in Japanese men and women: the research on osteoarthritis/osteoporosis against disability study. J Bone Miner Metab, 2009; 27(5): 620–8.
3. Kadono Y, Yasunaga H, Horiguchi H, Hashimoto H, Matsuda S, Tanaka S, et al. Statistics for orthopedic surgery 2006-2007: data from the Japanese Diagnosis Procedure Combination database. J Orthop Sci., Mar. 2010; 15(2): 162–70.
4. Cabinet Office Home Page [Internet]. [cited 2024 May 1]. Annual Report on the Aging Society: 2016 (Summary). Available from: https://www8.cao.go.jp/kourei/english/annualreport/2016/2016pdf_e.html
5. Kagoshima Prefecture/The specified page was not found. [Internet]. [cited 2024 May 1]. Available from: https://www.pref.kagoshima.jp/ae05/kenko-fukushi/koreisya/keikaku/documents/45011_20150423153452-1.pdf
6. Nakamura K, Ogata T. Locomotive Syndrome: Definition and Management. Clin Rev Bone Miner Metab., 2016; 14(2): 56–67.
7. Hirano K, Imagama S, Hasegawa Y, Ito Z, Muramoto A, Ishiguro N. Impact of low back pain, knee pain, and timed up-and-go test on quality of life in community-living people. Journal of Orthopaedic Science, Jan. 1, 2014; 19(1): 164–71.
8. Sasaki E, Ishibashi Y, Tsuda E, Ono A, Yamamoto Y, Inoue R, et al. Evaluation of locomotive disability using loco-check: a cross-sectional study in the Japanese general population. Journal of Orthopaedic Science, Jan. 1, 2013; 18(1): 121–9.
9. Kimura A, Seichi A, Konno S, Yabuki S, Hayashi K. Prevalence of locomotive syndrome in Japan: a nationwide, cross-sectional Internet survey. Journal of Orthopaedic Science, Sep. 1, 2014; 19(5): 792–7.
10. Iizuka Y, Iizuka H, Mieda T, Tajika T, Yamamoto A, Takagishi K. Population-based study of the association of osteoporosis and chronic musculoskeletal pain and locomotive syndrome: the Katashina study. Journal of Orthopaedic Science, Nov. 1, 2015; 20(6): 1085–9.
11. Muramoto A, Imagama S, Ito Z, Hirano K, Ishiguro N, Hasegawa Y. Physical performance tests are useful for evaluating and monitoring the severity of locomotive syndrome. Journal of Orthopaedic Science, Nov. 1, 2012; 17(6): 782–8.
12. Matsumoto H, Nakaso N, Matsuura A, Akita T, Hagino H. Relationship between Severity of Locomotive Syndrome and the Incidence of Falling, Prevalence of Low Bone Mass, and Sarcopenia. In 2016 [cited 2024 May 4]. Available from: https://www.semanticscholar.org/paper/Relationship-between-Severity-of-Locomotive-and-the-Matsumoto-

Nakaso/cc67d02cf0d45edc63dfc5f66552f33f9a63a886

13. Pisani P, Renna MD, Conversano F, Casciaro E, Muratore M, Quarta E, et al. Screening and early diagnosis of osteoporosis through X-ray and ultrasound based techniques. World J Radiol, Nov. 28, 2013; 5(11): 398–410.
14. Momoki C, Habu D, Ogura J, Tada A, Hasei A, Sakurai K, et al. Relationships between sarcopenia and household status and locomotive syndrome in a community-dwelling elderly women in Japan. Geriatr Gerontol Int., Jan. 2017; 17(1): 54–60.
15. Iizuka Y, Iizuka H, Mieda T, Tajika T, Yamamoto A, Takagishi K. Association between "loco-check" and EuroQol, a comprehensive instrument for assessing health-related quality of life: a study of the Japanese general population. Orthop Sci., Sep. 1, 2014; 19(5): 786–91.
16. Takahashi T, Ishida K, Hirose D, Nagano Y, Okumiya K, Nishinaga M, et al. Trunk deformity is associated with a reduction in outdoor activities of daily living and life satisfaction in community-dwelling older people. Osteoporos Int., Mar. 2005; 16(3): 273–9.
17. index_english.pdf [Internet]. [cited 2024 May 5]. Available from: https://locomo-joa.jp/assets/files/index_english.pdf
18. Sakamoto K, Endo N, Harada A, Sakada T, Tsushita K, Kita K, et al. Why not use your own body weight to prevent falls? A randomized, controlled trial of balance therapy to prevent falls and fractures for elderly people who can stand on one leg for ≤15 s. J Orthop Sci., Jan. 2013; 18(1): 110–20.
19. Hosoi T, Fujita H, Arai T, Ishibashi H. The Functional Characteristics of People who Continued Locomotion Training. Rigakuryoho Kagaku, 2012; 27(4): 407–10.
20. Maruya: Exercise interventions for improving motor... - Google Scholar [Internet]. [cited 2024 May 5]. Available from: https://scholar.google.com/scholar_lookup?title=Exercise%20interventions%20for%20improving%20motor%20function%20in%20community-dwelling%20middle-aged%20and%20elderly%3A%20effects%20due%20to%20differences%20in%20body%20mass%20index&author=K.%20Maruya&publication_year=2015&pages=99-107
21. Uusi-Rasi K, Patil R, Karinkanta S, Kannus P, Tokola K, Lamberg-Allardt C, et al. Exercise and vitamin D in fall prevention among older women: a randomized clinical trial. JAMA Intern Med., May 2015; 175(5): 703–11.