



RESEARCH ARTICLE

Relationship between Osteoporosis and Osteoarthritis with Locomotive Function Scale in Midlife Women

Manar A. Y. Alqishawi¹, Raya H. Mhmood², Reem I. Mohammed³

^{1,2}Al-Qahira PHCC, Nineveh, Iraq.

³Al-Zahraa PHCC, Ninavah, Iraq.

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Corresponding author:

Manar A. Y. Alqishawi

Email: manarammar.19741974@gmail.com

Al-Qahira PHCC, Nineveh, Iraq

ABSTRACT

Background: Locomotive syndrome is a condition of reduced mobility due to the impairment of locomotive organs. Understanding the role of the locomotive syndrome's underlying diseases, including osteoarthritis and osteoporosis within the frailty cycle in midlife women (a period of transition in women's lives) is important for the future. Frailty cycle in midlife is described as an intermediate, reversible status between healthy aging and dependence. Frailty is defined as a clinical syndrome with a decreased reserve and resistance to internal or external stressors. As a consequence, frail midlife women are at increased risk of incident disability and dependence. It is important to study the motor function of midlife women with osteoporosis and/or osteoarthritis and to use that knowledge to enhance their care, especially for women seeking help through the menopausal transition, and to provide a basis for organizing health care for these women based on their needs.

Methods: A specially designed questionnaire used to assess the motor function of 518 midlife women (40-65 years old). All of the participants completed a screening tool for Locomotive Syndrome called the Geriatric Locomotive Function Scale 9 (GLFS-9) questionnaire and had been diagnosed by Rheumatologists with osteoporosis and/or osteoarthritis. The participants were classified with a Geriatric Locomotive Function Scale 9 (GLFS9) more than 2 points into the Locomotive Syndrome grade I and II groups (versus the non-locomotive Syndrome (non-LS) group).

Results: The Locomotive Syndrome grade I and II groups had a greater proportion of patients with OA and/or OP than the non-LS group (76.1% vs 25.7%, respectively) (p-value 0.004). In the non-LS group (8.6%) were receiving nursing care versus respondents in both LS groups I and II (21.3%) (p-value 0.003) which is statistically highly significant. The mean mass index (BMI) for respondents with non-LS was 27.26, while for respondents with LSI the mean body mass index (BMI) was 26.89 and for LSII group the body mass index (BMI) was 31.6. Respondents in the LS I and II groups tended to be older than those in the non-LS group (p<0.002) there is an association between age and LS. The average age of those with LSI is 43.7 while the average age of those with LSII is 47.5. The vast

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majority (84%) of the LMSII group were postmenopausal women and 65.2% were premenopausal women and that the use of hormonal therapy is directly related to the severity of LMS

Conclusions: The current study confirmed that aging in women, menopause-related problems, musculoskeletal disease as osteoporosis and osteoarthritis have been significantly associated with locomotive syndrome. The locomotive syndrome risk may be reduced with treatment of comorbid musculoskeletal disease and exercise and dietary modifications.

The research findings suggest that a higher BMI may be a useful screening tool for LS. Moreover, since chronic diseases such as diabetes and hypertension were associated with LS, prevention of these disorders combined with weight control may help protect against LS.

Future locomotive syndrome risks can be managed through evidence-based interventions. It is appropriate to estimate future risks in all midlife women. Detecting LS in midlife women at its early phase will decrease the number of women needing nursing care.

INTRODUCTION

Locomotive syndrome requires nursing care, or being at risk of doing so, due to a decline in mobility resulting from a musculoskeletal system disorder. Researchers studying midlife have focused on women between the ages of 40 and 65, who typically experience multiple health problems: psychological, social, and biological transformations. Especially during the biological transition of menopause and transitions related to aging.¹ The frailty cycle in midlife is described as an intermediate, reversible status between healthy aging and dependence.² It is considered a major risk for adverse outcomes in midlife women, and frailty prevention is believed to be a crucial indicator of successful aging.³ Frailty is defined as a clinical syndrome with a decreased reserve and resistance to internal or external stressors.⁴ As a consequence, frail midlife women are at increased risk of incident disability and dependence.⁵ It is thus of important to determine the factors associated with frailty and disability in this population. This should help to implement preventive measures to avoid decline in functional capacity and dependence. The majority of midlife women's health-seeking behaviors depend on their tolerance of aging or their busy lifestyle with late marriages, looking after their own children or grandchildren and household work. As midlife women are engaged in occupations or are active in their extended families by raising their grandchildren even in old age, it is important to strengthen their general well-being during the transition by relieving troublesome menopausal symptoms, detecting, and preventing locomotive dysfunction.⁶ Women are at greater risk of musculoskeletal disorders because of the combination of their work and family demands.⁶ Research about midlife (premenopausal and postmenopausal) Locomotive Function is important because the knowledge provided in this research could be used to enhance care for women seeking help in menopause-related problems especially through a period of transition in their lives and provide a basis to organize healthcare for these women based on their needs.⁶ The locomotive syndrome is common in individuals with musculoskeletal disease as osteoporosis and osteoarthritis. Prevalence and co-existence of locomotive organ disorders, including osteoarthritis and osteoporosis, have been determined from baseline results of the Research on Osteoarthritis/Osteoporosis Against Disability (ROAD) study.⁷ Osteoporosis, which means porous bones, is a progressive

condition in which bones become structurally weak and are more likely to fracture or break. People with osteoporosis have brittle bones and are susceptible to fractures. They can break a bone with even a minor fall and may suffer compression fractures of the spine without even realizing it.⁷ Menopause is one of the most common causes of osteoporosis. As hormones change to accommodate normal menopausal changes, estrogen levels start to fluctuate and then drop. Since estrogen helps prevent bones from getting weaker by slowing the natural breakdown of bone, its reduction during menopause significantly speeds up bone loss.⁸ In women, osteoporosis and associated fractures are common after midlife and will increase with age. Osteoporosis reduces the quality of life and productivity for many older women while increasing the burden on healthcare resources.⁹ Osteoarthritis (OA) is the most common form of arthritis and a leading cause of disability. It is typically defined in epidemiologic studies on the basis of radiographic findings and consideration of symptoms.¹⁰

Osteoarthritis causes pain and limits range of motion (the ability to flex and extend the joints) due to abrasion of the articular cartilage. It's particularly common in the joints of the knees, hands and hips. The incidence of osteoarthritis (OA) increases after menopause and related to hormonal changes in women.¹¹ Estrogen deficiency is known to affect the development of osteoarthritis (OA). Osteoarthritis strikes women more often than men and it increases in prevalence, incidence, severity with a preponderance to polyarticular involvement, with increased hand and knee OA after menopause.¹⁰

Aim of the study

To determine the relationship between the Geriatric Locomotive Function Scale 9 (GLFS-9) score and osteoarthritis (OA) and osteoporosis (OP) in midlife participants and estimate future risks in all middle-aged women by obtaining the target clinical history using a semi-structured questionnaire to assess motor function of the participating women by completing the GLFS-9 questionnaire.

METHODOLOGY

Study design: A representative cross-sectional survey using semi-structured questionnaires was conducted from 30th May 2022 to 31st January 2023. The questionnaire consisted of 24

questions addressed to middle-aged women between the ages of 40 and 65 who had been diagnosed by Rheumatologists with osteoporosis and/or arthritis.

The study was designed as a questionnaire that restricted to answering, asking the respondent to make choices yes or no, checking items on a list, or selecting from multiple choice answers. Restricted questions are easy to tabulate and compile. The questionnaire contributes to provide the necessary information to identify the motor function of midlife women with osteoarthritis and osteoporosis using a set of scientific research tools, which enables authors to work on a solid scientific basis used to enhance care for women seeking help in midlife problems and provide a basis to organize health care for these women based on their needs.

In 2007, the Japanese Orthopedic Association (JOA) proposed the term “locomotive syndrome” (LS) to describe a condition in high-risk musculoskeletal disease patients who are highly likely to require nursing care.¹² The JOA developed a screening tool, the 25-question Geriatric Locomotive Function Scale “GLFS-25” and the 5-question Geriatric Locomotive Function Scale “GLFS-5” in 2012. Then in 2018 a short form of GLFS-25 (GLFS-9) was developed by a group of researchers which was confirmed by an IRT analysis, a PCA, and an ROC analysis later.¹³

The GLFS-25 consists of 25 questions. The respondent selects an answer to each question from a 5-point scale ranging from no impairment (0 points) to severe impairment (4 points). Upon completion of the questionnaire, the total score is calculated based on the responses to each of the 25 questions (minimum 0, maximum 100). Finally, GLFS-25 divides into 3 grades: Grade 1 LS, Grade 2 LS and Normal. However, GLFS-5 can only screen Normal and LS but can't classify Grade 1 and Grade 2 LS.¹³

In this study the authors used the short form of GLFS-25 (GLFS-9) which is easier than GLFS-25 and more accurate than GLFS-5, to screen participants. The authors believe that the GLFS-9 may allow for the more accessible screening and prevention of LS.

The short form of GLFS-25 (GLFS-9) consists of 9 questions that are included in the GLFS-25. These 9 items are graded on the 5-point scale; the total score (0–36) was used to diagnose patients with Grade 1 LS (3–5 points) or Grade 2 LS (≥ 6 points) LS; while a score of ≤ 2 points defined No-LS (normal). The ability of GLFS-9 to predict an IRT analysis, a PCA, and a ROC analysis confirmed LS.¹³

The authors defined the participants with a GLFS-9 > 2 points as having Locomotive Syndrome (LS) according to Seichi *et al.* (2012)¹⁴ criteria and classified participants into LS and non-LS group.¹⁵

Participants

Participants were recruited via Direct communication with the study sample. All participants were required to be female and were previously diagnosed with osteoporosis and/or osteoarthritis. The ages of the participants ranged between 40 and 65 years (mean age 46.1 years). A total of 518 participants

completed the questionnaire. (Table 1) Participation was voluntary.

Participants were asked to complete a self-administered 9-item Geriatric Locomotive Function Scale “GLFS-9” questionnaire. Participation was voluntary.

The information and data determine commenced on May 14th 2022, according to the goals and assumptions of the scientific research. Questionnaire form developed and arranged on May 19th 2022. It was written in Arabic because it's the public language of the participants. The sample size was 518 participants whose answers were collected from May 30th, 2022 to January 31st, 2023. Confidentiality of all information provided by survey participants is emphasized, and the importance of participating in a way that helps solve motor function problems associated with midlife and provides a basis for organizing health care for these women is emphasized.

The authors started with 40 questions, then shortened it to 24 questions, considering that the questions are related and clear to the subjects, while avoiding questions with complex structures. To ensure questions were robust and reliable several academics reviewed them in full and suggested modifications. These modifications were incorporated in full for the final survey. To ensure the accuracy of the survey's questions and their relatedness to the aim of the study, questions were authenticated and validated by volunteered multidisciplinary experts. In addition, language and clarity of the survey was assessed.

The survey was broadly divided into four sections. The first section consisted of 5 questions about sociodemographic information of the participants (age, social situation, number of children, work status and academic achievement). The second section of the questionnaire consisted of four questions about the participant's menstrual cycle. The third section of the questionnaire consisted of six questions about medical health information (weight, height, presence of chronic diseases such as ((cardiovascular diseases, hypertension, DM, stroke, coronary heart disease, rheumatoid arthritis, chronic renal failure, anemia, and gastroesophageal reflux disease)) history of smoking, number of cigarettes smoked per day, history of medications taking, history of osteoporosis or/and arthritis and the need for daily help and nursing care). The final section of the survey was made up of nine questions that are included in the GLFS-25¹⁶ which represents the short-form of GLFS-25 (GLFS-9) to classify the participants into the three main groups of the survey, the locomotive syndrome grade I (LSI) group, the locomotive syndrome grade II (LSII) group and the non-locomotive syndrome (non-LS) group.

Statistical analysis Means \pm standard deviations were calculated for all variables unless otherwise noted. Significant differences in baseline characteristics (age, weight, occupation and no. of children), OA, OP, and need for nursing services between the groups were determined.

When authors presented the survey to the participants, they confirmed that this questionnaire is intended for women aged 40-65 years who were diagnosed with osteoporosis and/or arthritis and had x-rays of their joints confirming

their diagnosis of osteoarthritis and/or dual-energy X-ray absorptiometry to osteoporosis (OP).

The authors focused on the main axis related to the purpose of the survey, which is achieved by making sure that most of the participants are in the transition to menopause or already in menopause, so authors asked them questions related to the menstrual cycle. (Did your period stop? What is the duration of menopause? Do you use hormonal contraceptives? And for how long?)

RESULTS

Most of the participants were divided between public or private sector employees and housewives, according to those percentages (52.8%) for employees and (37.4%) for housewives. (Table 2) 330 out of 518 (63.7%) respondents confirmed that they had symptoms of osteoporosis and/or arthritis (Table 1). The majority of the respondents were between the ages of 40-50 years (49%) (Table 2), and about 356 out of 518 (68.7%) of the respondents had not yet entered menopause (pre-menopause). All of the respondents were neither smokers nor taking steroidal medications and 162 out of 518 (31.2%) respondents confirmed that they have not had their period for more than a year (Post menopause). Only 11.5% of all respondents use hormonal therapy (Tables 1-7).

This study included three main groups that formed the basis of the research, 80 patients in the Locomotive grade I group (15.4%), 368 patients in the Locomotive grade II group (71.1%) and 70 patients in the non-Loocomotive group (13.5%) (Table 3).

The average age of participants with LSI is 43.7 while the average age of participants with LSII is 47.5. as shown in (Table 4). 100% of the retired participants are from the LSII group. (Table 7).

In the non-LS group (8.6%) were receiving nursing care versus respondents in both LS groups I and II (21.3%) (p-value 0.003). (Table 4)

The LS II group had a greater proportion of patients with OA and/or OP than the non-LS group (76.1% vs 25.7%, respectively) (p-value 0.004) (Table 4).

Table 1: Characteristics of study participants.

Variable for component	Overall
Participant	518
Female (%)	100
Age (years, mean (SD))	46.1
Height (cm, mean (SD))	159.7
Weight (kg, mean (SD))	77.3
body mass index (BMI)	30.31
GLFS-9 (points, mean (SD))	11.2
LS (%)	86.1
OP and/or OA (%)	63.7
Chronic disease (%)	32.8
having daily assistance and nursing care (%)	13.5

GLFS: Geriatric Locomotive Function Scale

SD: Standard Deviation

OP: Osteoporosis

OA: Osteoarthritis

Table 2: Sociodemographic characteristic of study sample

Sociodemographic characteristic	No. of participant
Age group	
<40 years	114 (22%)
40-50 years	254 (49%)
50-60 years	90 (17.4%)
60-65 years	60 (11.6%)
Marital state	
Single	34 (6.5%)
Married	434 (83.8%)
Divorced, widow	50 (9.7%)
Number of children	
No children	48 (9.2%)
1-3	204 (39.4%)
3-5	176 (34%)
>5	90 (17.4%)
Occupation	
Unemployed	4 (1%)
Student	16 (3%)
Employed	274 (52.8%)
Housewife	194 (37.4%)
Retired	30 (5.8%)
Educational level	
Primary school	50 (9.7%)
Secondary school	82 (15.8%)
Bachelor	244 (47.1%)
Master	126 (24.3%)
None	16 (3.1%)
Smoker	
Yes	0 (0%)
No	518 (100%)
Chronic disease	
Yes	170 (32.8%)
No	348 (67.2%)
OA and/or OP	
Yes	330 (63.7%)
No	188 (36.3%)

OP: Osteoporosis

OA: Osteoarthritis

Table 3: The three main groups of the study according to Geriatric Locomotive Function Scale points

GLFS-9 cut-off value	No. of participant T=259	(%)
Normal (0-2 points)	70	13.5
Locomo grade I (3-5 points)	80	15.4
Locomo grade II (6-36 points)	368	71.1

GLFS: Geriatric Locomotive Function Scale

The mean weight and the body mass index (BMI) for respondents with non-LS were 69.6 kg and 27.26, while for respondents with LSI the mean weight was 70.3 kg and the

Table 4: Comparison of characteristics between the non-LS and LS groups

Variable for component	Non-LS	LS I	LS II	P-value
Participant	70	80	368	
Female (%)	100	100	100	
Age (years, mean (SD))	41.4	43.7	47.5	0.002
Height (cm, mean (SD))	159.8	161.7	159.3	0.143
Weight (kg, mean (SD))	69.6	70.3	80.2	0.003
body mass index (BMI)	27.26	26.89	31.6	0.003
GLFS-9 (points, mean (SD))	0.9	4.1	14.8	0.000
OP and/or OA (%)	25.7	40	76.1	0.004
Chronic disease (%)	20	22.5	37.5	0.000
Having daily assistance and nursing care (%)	8.6	5	16.3	0.003

Non-LS: Non-Loocomotive Syndrome, GLFS-9 score 0-2 points

LS I: Locomotive Syndrome grade I, GLFS-9 score 3-5 points

LS II: Locomotive Syndrome grade II, GLFS-9 score 6-36 points

SD: Standard Deviation

OP: Osteoporosis

OA: Osteoarthritis

body mass index (BMI) was 26.89 and for LSII group 80.2 kg and the body mass index (BMI) was 31.6 (Table 4).

Regarding the chronic disease (Table 4) demonstrates that 37.5% of respondents with LSII have a chronic disease, 22.5% of respondents with LSI have a chronic disease, while only 20% of respondents with non-LS have a chronic disease.

In (Table 5) entitled (Participant's menstrual cycle and hormonal history by groups) and after focusing on LMSII group, the table revealed that the vast majority (84%) of postmenopausal women were from the LMSII group, 65.2% of premenopausal women were from the LMSII group, and (83.3%) women using hormonal therapy were also from the LMSII group.

Going back to (Table 3) 71.1% of midlife women may develop locomotive syndrome in the future on the other hand 76.1% of those with OA and OP may develop locomotive syndrome II in the future (Table 4). 68.7% of premenopausal women have early locomotive syndrome (Table 5).

The LS II group had a greater proportion of respondents who had given birth to more children than the non-LS group (p-value 0.002) (Table 6).

Regarding the correlation between LS and occupation, in the non-LS group (8.2%) were housewives versus respondents in the LSII group (76.3%) (p-value 0.001) and (16.1%) were employed in the non-LS group versus (66.4%) respondents in the LSII group. (Table 7)

DISCUSSIONS

To study the motor function of midlife women with osteoporosis and/or osteoarthritis, to use that knowledge to enhance care for these women, and to provide a basis for organizing health care for these women based on their needs, authors in this study classified the respondents to three main groups, the locomotive syndrome grade I (LSI) group, the locomotive syndrome grade II (LSII) group and the non- locomotive syndrome (non-LS) group and compared between the three groups.

This study found that respondents in the LSI and LSII groups tend to be older than those in the non-LS group, there is a correlation between age and LS and there is an increase in the risk of developing LS with increasing age. The average age of participants with LSI was 43.7, while the average age of participants with LSII rose to 47.5 and similar to other research accomplished in Japan which revealed that the prevalence of all LS stages significantly increased with age (p for trend, $p < 0.001$) (Nagahama Study).¹⁷

A previous study confirms that the movable structures that tend to bear the most loads in the human body and absorb shocks are the intervertebral discs and articular cartilages. These structures have minimal regeneration capacity, as they lack a direct blood supply.^{18,19,20} So wear out of these joints tends to happen with aging.²¹ This may explain why 100% of the retired participants in this study are from the LSII group because they are of old age group.

The present study also found that LS II group had a greater proportion of respondents who had given birth to more children than the non-LS group (p-value 0.002). Pregnancy and labor put extra pressure on joints and muscles and can lead to musculoskeletal system disorders similar to other study published in 2021 entitled (Grand multiparity associations with low bone mineral density and degraded trabecular bone pattern) showed that postmenopausal women, aged above 64 years, with history of grand multiparity (defined as more than 4 deliveries) had lower areal bone mineral density aBMD and more degraded lumbar spine trabecular bone score TBS compared to less parous women.²²

The LS II group had a greater proportion of patients with OA and/or OP than the non-LS group (76.1% vs 25.7%, respectively) (p-value 0.004) and a greater proportion of respondents in both LS groups I and II (21.3%) (p-value 0.003) receiving nursing care versus (8.6%) in non-LS group similar to other study done in Japan entitled (research on osteoarthritis/osteoporosis against disability) (ROAD) in 2005 which found that musculoskeletal diseases, especially osteoarthritis (OA)

Table 5: Participant's menstrual cycle and hormonal history by groups

Variable for component	Non-LS	LS I	LS II	Total	p-value
Pre menopause	58 (16.3%)	66 (18.5%)	232 (65.2%)	356 (68.7%)	0.000
Post menopause	12 (7.4%)	14 (8.6%)	136 (84%)	162 (31.2%)	0.000
Use hormonal therapy	4 (6.7%)	6 (10%)	50 (83.3%)	60 (11.5%)	0.367

Non-LS: Non-Loocomotive Syndrome, GLFS-9 score 0-2 points

LS I: Locomotive Syndrome grade I, GLFS-9 score 3-5 points

LS II: Locomotive Syndrome grade II, GLFS-9 score 6-36 points

Table 6: Participant's number of children by group

Variable for component	Non-LS	LS I	LS II	p-value
Number of children				
No children	18 (37.5%)	8 (16.7%)	22 (45.8%)	0.002
1-3	30 (14.7%)	32 (15.7%)	142 (69.6%)	
3-5	16 (9.1%)	26 (14.8%)	134 (76.1%)	
>5	6 (6.7%)	14 (15.5%)	70 (77.8%)	

Non-LS: Non-Loocomotive Syndrome, GLFS-9 score 0-2 points

LS I: Locomotive Syndrome grade I, GLFS-9 score 3-5 points

LS II: Locomotive Syndrome grade II, GLFS-9 score 6-36 points

Table 7: Participant's occupation by group

Variable for component	Non-LS	LS I	LS II	p-value
Occupation				
Unemployed	2 (50%)	0 (0%)	2 (50%)	0.001
Student	8 (50%)	2 (12.5%)	6 (37.5%)	
Employed	44 (16.1%)	48 (17.5%)	182 (66.4%)	
Housewife	16 (8.2%)	30 (15.5%)	148 (76.3%)	
Retired	0 (0%)	0 (0%)	30 (100%)	

Non-LS: Non-Loocomotive Syndrome, GLFS-9 score 0-2 points

LS I: Locomotive Syndrome grade I, GLFS-9 score 3-5 points

LS II: Locomotive Syndrome grade II, GLFS-9 score 6-36 points

and osteoporosis (OP), impair activities of daily life (ADL) and quality of life (QOL) in the elderly.²³

There was an association between the body mass index (BMI) of the responders with the motor syndrome. The LSI and II groups had a higher BMI than the non-LS group. The mean body mass index (BMI) for respondents with non-LS were 27.26, while for respondents with LSI the mean (BMI) was 26.89 and for LSII group (BMI) was 31.6. Again, these results similar to other study done also in Japan entitled (Locomotive syndrome is associated with body composition and cardiometabolic disorders in elderly Japanese women) showed that participants with a BMI ≥ 23.5 kg/m² had a significantly higher risk for LS than those with a BMI < 23.5 kg/m² ($p < 0.01$) (Nakamura et al).²⁴

This result may indicate that high BMI is a useful screening tool for LS prevention in middle-aged women.

Lifestyle-related diseases, such as being overweight or having diabetes, may cause osteoarthritis or osteoporosis; therefore, a relationship between metabolic disease and musculoskeletal disease may exist.²⁵

Authors also observed an association between LS and chronic disease. 37.5% of respondents with LSII have a chronic disease, 22.5% of respondents with LSI have a chronic disease, while only 20% of respondents with non-LS have a chronic disease.

Those results are consistent with a previous study that confirmed that the relationship between chronic diseases such as diabetes, hypertension coronary heart disease, chronic renal failure, rheumatoid arthritis and LS is an independent relationship. This is caused by amplified body pain, decreased social activities and systemic cognitive function.¹⁷

Furthermore, authors focused on the LMSII group and they found that the vast majority (84%) of postmenopausal women were from the LMSII group, 65.2% of premenopausal women were from the LMSII group, and (83.3%) women using hormonal therapy were also from the LMSII group.

To our knowledge, there is no previous study showing an association between locomotive syndrome with menopause in women but there are many studies about the association between menopause and osteoporosis. A study done in 2015 entitled (Primary osteoporosis in postmenopausal women) shows that one of the most common causes of osteoporosis is menopause. As hormones change to accommodate normal menopausal changes, estrogen levels start to fluctuate and then drop. Since estrogen helps prevent bones from getting weaker by slowing the natural breakdown of bone, its reduction during menopause significantly speeds up bone loss and cause osteoporosis, one of LS's main causes.⁸

Regarding the correlation between LS and occupation, the current study showed that the non-LS group (8.2%) were housewives versus respondents in the LSII group (76.3%) (p -value 0.001) and (16.1%) were employed in the non-LS group versus (66.4%) respondents in the LSII group. Again, no previous study shows an association between locomotive syndrome and occupation in women.

Interestingly, this study was limited to women aged 40 to 65 years, to be surprised by the number of women with locomotive syndrome, which may raise concern. 71.1% of midlife women will develop locomotive syndrome II in the future and 76.1% of those with OA and OP will develop locomotive syndrome II in the future. 83.7% of premenopausal women have early locomotive syndrome compared to Japanese women who have it after 80 years of age.

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