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KARNATAKA RADIOLOGY EDUCATION PROGRAM

CLINICAL RESEARCH – BRIDGING IMAGING & INNOVATION

SESSION – 10 – MANUSCRIPT SUBMISSION CHECKLIST

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MANUSCRIPT SUBMISSION CHECKLIST

TITLE PAGE

- ✓ TITLE
- ✓ AUTHORS AND AFFILIATIONS
- ✓ CORRESPONDING AUTHOR'S CONTACT INFORMATION
- ✓ MANUSCRIPT TYPE (E.G., ORIGINAL RESEARCH, REVIEW, CASE REPORT)

Title: Use of ChatGPT Large Language Models to Extract Details of Recommendations for Additional Imaging From Free-Text Impressions of Radiology Reports

Type of Article: Original Research

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MANUSCRIPT SUBMISSION CHECKLIST

ABSTRACT

- ✓ BRIEF SUMMARY OF THE STUDY (300 WORDS MAX)
- ✓ PURPOSE, METHODS, RESULTS, AND CONCLUSION

KEYWORDS

- ✓ 3-5 RELEVANT KEYWORDS

Abstract

Objective The genesis of both osteoporosis and sarcopenia is multifactorial, complicated, and interrelated. The present study has been undertaken to analyze the prevalence of low bone mineral density (BMD) and the pattern of imaging markers of sarcopenia (paraspinal skeletal muscle area [SMA] and skeletal muscle index [SMI] with respect to clinicodemographic profile in middle-aged patients (30–45 years) undergoing evaluation for low back pain (LBP).

Materials and Methods Magnetic resonance imaging (MRI) of the lumbosacral spine and/or sacroiliac joints was done on 3T MRI. BMD of the lumbar spine (L1 to L4) was assessed using a dual-energy X-ray absorptiometry scan. SMA was calculated by measuring the cross-sectional area of paraspinal muscles (bilateral psoas, erector spinae, and multifidus), and SMI was calculated by dividing SMA by height^2.

Results The prevalence of osteoporosis was 12.1% in patients of age 30 to 45 years presenting with LBP. Both osteoporosis and paraspinal muscle mass were statistically associated with the duration of symptoms (p-value <0.05). No statistically significant difference was observed in different MRI findings, that is, normal, inflammatory, infective, and degenerative etiology.

Conclusion Low BMD and loss of muscle mass in cases with LBP are more related to duration of disease rather than etiology or gender in middle-aged subjects. Early intervention to manage LBP may prevent progression to osteoporosis and sarcopenia in young adults.

Keywords

low back pain - bone mineral density - osteoporosis - sarcopenia - skeletal muscle area - skeletal muscle index

MANUSCRIPT SUBMISSION CHECKLIST

INTRODUCTION

- ✓ BACKGROUND INFORMATION
- ✓ RESEARCH QUESTION OR HYPOTHESIS
- ✓ OBJECTIVES OF THE STUDY

Introduction

Osteoporosis is a systemic skeletal disease characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. Dual-energy X-ray absorptiometry (DEXA) is the technique of choice in assessing bone mineral density (BMD).[1] The World Health Organization (WHO) uses T-scores to define and classify BMD measurements in the elderly population. However, in men younger than 50 years, premenopausal women, and adolescents who have not yet reached peak bone mass, WHO uses Z-score, that is, BMD more than 2 standard deviations (SDs) below the mean BMD matched for age, gender, and ethnicity (Z-score < – 2 SD).[2]

Low back pain (LBP) is experienced in 60 to 80% of adults and 30% of adolescents at some point in life.[3] Osteoporosis can present as acute or chronic LBP with clinical fracture of the vertebral body.[4] According to a study conducted in southern India, the prevalence of osteoporosis is 10% in middle-aged patients attending orthopaedics outpatient department (OPD).[5] According to Hestbaek et al,[6] the annual LBP prevalence in young adults is 32.4%. Cases with nonspecific LBP have been associated with lower BMD values in various reports.[7] [8]

Sarcopenia is defined as a pathological decrease in muscle mass, which affects performance.[9] Psoas and paraspinal cross-sectional area (CSA) measurement on computed tomography is a quick and easy method to assess sarcopenia.[10] Reports regarding the higher prevalence of sarcopenia in premenopausal osteoporotic women,[11] as well as implicating sarcopenia as the cause of LBP in the elderly population, have been published.[12] Iwahashi et al[13] reported that sarcopenic patients had exacerbated LBP and poor quality of life.

The genesis of osteoporosis and sarcopenia is multifactorial and interrelated; therefore, they need to be assessed and managed together. The available literature has cited them both as the cause and effect of LBP in the elderly population. Moreover, the two entities that are considered diseases of the elderly population may have their genesis at an early age. The present study has been undertaken to analyze the prevalence of low BMD and the pattern of imaging markers of sarcopenia (paraspinal skeletal muscle area [SMA] and skeletal muscle index [SMI] with respect to clinicodemographic profile in middle-aged patients (30–45 years) undergoing evaluation for LBP.

MANUSCRIPT SUBMISSION CHECKLIST

METHODS

- ✓ STUDY DESIGN (E.G., RCT, OBSERVATIONAL STUDY)
- ✓ POPULATION/SAMPLE SIZE
- ✓ INCLUSION AND EXCLUSION CRITERIA
- ✓ DATA COLLECTION METHODS
- ✓ ETHICAL CONSIDERATIONS (E.G., IRB APPROVAL)

This prospective observational study was conducted after the approval of the institutional ethics committee. Subjects of the age group 30 to 45 years visiting our department between February 2021 and August 2022 for LBP evaluation using MRI of the lumbosacral (LS) spine and/or sacroiliac (SI) joints were included in the study after informed consent.

Patients having history of trauma consistent with imaging abnormality, chronic medical disease (diabetes, chronic kidney disease, chronic liver disease), medication for other indications (steroid, antiepileptic, thyroxin, heparin), endocrine diseases (hypogonadism, Cushing syndrome, growth hormone deficiency, hyperparathyroidism), kyphoscoliosis, malignancy, history of pelvic inflammatory disease, causing LBP in female subjects, congenital bony lesions, and pregnancy were excluded.

The sample size of 140 was calculated using the formula: $n = Z^2 PQ/e^2$,

where n = sample size, $Z = 1.96$ at 95% confidence interval, P = prevalence (taking the prevalence of osteoporosis as 10% in middle-aged patients attending orthopaedics OPD as per a study conducted by Chitten and James[5]), $Q = 1 - P$, e = standard margin of error (taken as 5).

MANUSCRIPT SUBMISSION CHECKLIST

IMAGING PROTOCOLS

- ✓ DESCRIPTION OF IMAGING TECHNIQUES USED
- ✓ EQUIPMENT AND SETTINGS
- ✓ CONTRAST AGENTS (IF APPLICABLE)

BMD was assessed on bone densitometer MEDIX DR (MAX kVp 90, MAX mA/mAs 72). BMD was assessed using a DEXA scan at the lumbar spine (anteroposterior L1 to L4 vertebrae). The procedure was explained to the patients, and the patient's weight and height were recorded. The patient was positioned supine in the scanner, and a scan was done. The region of interest (ROI) was placed at L1 to L4 vertebrae, as shown in [Fig. 1], and analysis was done.

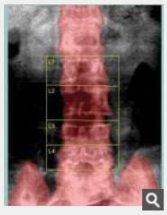

Fig. 1 *Dual-energy X-ray absorptiometry (DEXA) image showing region of interest in lumber spine while assessing bone mineral density using DEXA scan.*

MRI was done on 3 Tesla MRI GE Signa OT HDxt 32 channel MRI machine (WB0427). MRI of the LS spine and/or SI joint was done with standard sequences. The LS spine study used axial T2, sagittal T2, T1, short tau inversion recovery (STIR), coronal STIR, postcontrast (if needed) sagittal and axial fat-saturated T1 postcontrast sequences. The field of view was selected from the lower border of D11 to the tip of the coccyx. For the SI joint study, coronal T1, T2, STIR, axial T1, and STIR sequences were used. SMA and SMI were assessed on axial T2-weighted images at the L4–L5 level as a marker of sarcopenia. SMA was calculated by measuring and summating the CSA of bilateral multifidus and erector-spinae muscles as well as bilateral psoas muscles at the L4–L5 level by drawing ROI around the muscle bulk ([Fig. 2]).

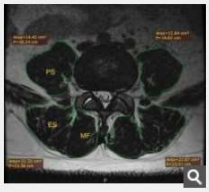

Fig. 2 *Paraspinal muscle cross-sectional area measurement at L4–L5 level in axial T2 sequence of lumbar spine. ES, erector spinae; MF, multifidus; PS, psoas muscle.*