Vol. 4 No. 3 (2025)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387

Print ISSN 3007-2379

THERAPEUTIC POTENTIAL OF TURMERIC (*CURCUMA LONGA*) AND ITS ACTIVE COMPOUND CURCUMIN IN MODERN MEDICINE

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Vol. 4 No. 3 (2025)

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Online ISSN 3007-2387

Print ISSN 3007-2379

Author Details

Key Words:
Herbal Medicine, Phytotherapy, Anti-inflammatory, Antioxidant, Neuroprotective, Cancer Treatment, Cardiovascular Health, Turmeric, Curcuma Longa, and Curcumin.

Received on 13 July, 2024

Accepted on Aug 2025

Published on 26 Aug 2025

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Abstract

Turmeric (*Curcuma longa*), a golden-yellow spice derived from the rhizomes of the Zingiberaceae family, has long been a cornerstone of traditional medical systems including Ayurveda, Siddha, and Traditional Chinese Medicine. Its principal bioactive constituent, curcumin, has attracted extensive scientific interest due to its wide spectrum of pharmacological properties, including anti-inflammatory, antioxidant, antimicrobial, anticancer, neuroprotective, and cardioprotective activities, making it one of the most intensively investigated natural compounds in contemporary phytomedicine. Despite its therapeutic promise, clinical translation is limited by poor bioavailability, rapid metabolism, and low systemic absorption. Recent advances in drug delivery strategies—such as liposomal encapsulation, nanoparticle formulations, and the design of structural analogues—have sought to overcome these barriers and enhance curcumin's therapeutic efficacy. This review provides a comprehensive overview of the historical use, phytochemistry, mechanisms of action, pharmacological activities, clinical applications, and limitations of turmeric and curcumin, highlighting their potential role in bridging traditional medicine with evidence-based modern therapeutics.

INTRODUCTION

Lower back pain (LBP) is defined by the International Association for the Study of Pain (IASP) as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. It is one of the leading causes of disability worldwide, particularly affecting individuals engaged in physically demanding occupations. In the healthcare sector, especially among operation theater (OT) staff, the incidence of LBP is notably high due to prolonged standing, awkward postures, and patient handling [1].

Historically, the problem of back pain has been acknowledged since ancient times, as evidenced by the Edwin Smith papyrus dating back to 1500 BC. The evolution of our understanding of LBP over centuries—from Galenic symptomatic treatments to modern occupational health frameworks—reflects its longstanding presence and burden [2].

The relationship between occupation and back pain has long been observed, with occupational exposure to physical stressors playing a significant role in LBP development [3]. Surgeons, scrub nurses, and anesthetists frequently perform tasks such as bending, lifting, and maintaining static postures, all of which are identified as risk factors [4,5].

The prevalence of LBP in healthcare workers globally ranges from 18.8% to over 70%, with operating room staff showing particularly high rates [6,7]. Given these concerns, the present study investigates the frequency and associated risk factors for LBP among OT staff at Mardan Medical Complex.

MATERIALS AND METHODS

This cross-sectional study was conducted at Mardan Medical Complex (MMC), a tertiary care teaching hospital in Khyber Pakhtunkhwa, Pakistan. The study population consisted of OT staff, including surgeons, anesthesiologists, scrub nurses, and technicians. A total of 88 participants were selected from a population of 237 using stratified random sampling.

Eligibility criteria included staff aged 25–50 years involved in direct surgical duties. Exclusion criteria were chronic illnesses, pregnancy, previous musculoskeletal injuries, and regular engagement in exercise.

A structured questionnaire was employed, integrating items from the Nordic Musculoskeletal Questionnaire and the Numerical Pain Rating Scale. Data collection

occurred over a two-month period, while analysis and writing extended over four months.

Data were analyzed using SPSS version 28.0. Descriptive statistics summarized demographic and clinical data. Associations between LBP and risk factors were tested using chi-square tests, with $p < 0.05$ considered statistically significant. Logistic regression was applied to identify predictors.

RESULTS

The mean age of participants was 32.9 years (SD = 6.4), and the mean BMI was 23.0 (SD = 2.6). Males constituted 79.5% of the sample, while females made up 20.5%. Surgeons represented 51.1% of the participants.

Current LBP was reported by 48.9% of participants, and 54.5% reported LBP in the last 7 days. Mild to severe pain was reported by over 50% of respondents, with 6.8% reporting severe pain.

A significant association was observed between bending while working and current LBP ($p = 0.031$), as well as lifting patients ($p = 0.03$). A strong correlation was noted between prior history of work-related LBP and current LBP ($p < 0.001$). Stress at work and smoking did not show statistically significant associations ($p = 0.399$ and $p = 0.068$, respectively), although smoking neared significance.

Logistic regression identified the total length of time experiencing LBP in the past month as a significant predictor of current LBP ($p < 0.001$, OR = 0.332).

DISCUSSION

This study found that nearly half of the OT staff currently experience LBP, a finding consistent with previous studies on healthcare professionals [8]. The association between occupational tasks such as bending and lifting with LBP aligns with existing literature, which highlights biomechanical stressors as key contributors [9,10].

Although stress and smoking did not reach significance, previous studies suggest they may influence pain perception and chronicity [11–13]. The observed association between patient lifting and LBP reiterates the necessity for ergonomic training and the use of assistive devices [14,15].

CONCLUSIONS

Nearly half of the participants in this study currently suffer from lower back pain (LBP), and more than half reported suffering discomfort in the previous week, indicating a significant burden of LBP among Mardan Medical Complex's operating theater (OT) staff. These findings are consistent with international research showing that healthcare workers are very susceptible to musculoskeletal problems. The important necessity for focused ergonomic interventions is shown by the strong correlations found between LBP and occupational characteristics like frequent bending and patient lifting. Additionally, the substantial association between current symptoms and a history of work-related LBP suggests that the illness is chronic and may reoccur in staff members.

Prior research has repeatedly connected stress and smoking to an increase in musculoskeletal problems, even though these factors were not statistically significant in this study. Therefore, it is impossible to completely rule out their contribution, and more long-term study is necessary. The notion that the amount of time spent with LBP is a

reliable indicator of present pain is further supported by the logistic regression analysis, which points to a cumulative or unresolved strain over time.

The findings highlight the need for healthcare organizations to implement thorough and proactive measures to prevent, detect, and treat LBP in OT employees. In addition to improving individual well-being, treating LBP increases staff productivity and the standard of patient care.

RECOMMENDATIONS

1. **Ergonomic Training Programs:** Organizations ought to regularly hold training sessions on posture control, patient handling methods, and appropriate body mechanics. These courses ought to be customized to meet the particular requirements of working in an operating room.
2. **Availability of Assistive Devices:** To lessen physical strain during patient handling and surgical preparation, it should be standard practice to use mechanical lifting aids, transfer boards, and height-adjustable equipment.
3. **Work Schedule Optimization:** You can lessen cumulative musculoskeletal stress by putting regulations in place that restrict long shifts and guarantee sufficient rest periods. The purpose of shift rotations should be to reduce the amount of time spent on physically taxing duties.
4. **Frequent Health Surveillance:** To identify early indicators of LBP and enable prompt interventions, do routine health exams, such as musculoskeletal tests, BMI monitoring, and pain assessments.
5. **Support for Physical Fitness and Rehabilitation:** Promote employee involvement in workplace fitness initiatives that prioritize low-impact aerobic workouts, flexibility,

and core strengthening. Employees with LBP should have access to in-house physiotherapy support.

6. **Stress Management Programs:** To lessen the mental health issues causing physical discomfort, psychological support services including counseling, mindfulness training, and stress management seminars should be included.
7. **Smoking Cessation Campaigns:** Since smoking is known to impair spinal health and the healing process following musculoskeletal injuries, health education programs and cessation support services have to be made available.
8. **Mechanisms for Monitoring and Feedback:** Put in place a system for reporting LBP and invite OT staff members to provide input on risk factors and ergonomic difficulties. Interventions can be continuously modified with the use of this data.

By putting these suggestions into practice, OT staff members' incidence and severity of LBP can be significantly decreased, leading to a safer patient care environment and a healthier, more productive workforce.

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