



Lumbar Flexibility and Chronic Low Back Pain Prevalence in Regular Versus Irregular Salah Performers: A Comparative Cross-Sectional Study in Mixed-Gender Adults

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Abstract

Background: Low Back Pain (LBP) ranks among the leading causes of years lived with disability globally, with habitual physical inactivity identified as a principal modifiable risk factor. Daily Islamic prayer (Salah) involves a structured sequence of spinal flexion, extension, and postural loading that is mechanically distinct from sedentary behaviour and may exert protective effects on lumbar health. The extent to which regular Salah practice is associated with superior lumbar flexibility and reduced LBP burden in the general adult population has not been systematically quantified using validated clinical instruments.

Objectives: To compare lumbar flexibility and the prevalence and severity of chronic low back pain between adult males and females categorised as regular or irregular Salah performers.

Methods: Sixty mixed-gender adults (aged 20-45 years; 30 regular performers, 30 irregular performers) were enrolled in a comparative cross-sectional study. Lumbar flexibility was quantified using the Modified Schober Test (MST) and the Fingertip-to-Floor Test (FTFT). Pain severity and functional disability attributable to LBP were assessed with the Numerical Pain Rating Scale (NPRS) and the Oswestry Disability Index (ODI). Between-group comparisons were conducted using independent-samples t-tests and chi-square tests where appropriate ($\alpha=0.05$), with effect magnitude reported as Cohen's d.

Results: Regular Salah performers demonstrated significantly greater lumbar flexion on the MST (5.8 ± 0.7 cm vs. 4.1 ± 0.9 cm; $p<0.001$; $d=2.13$) and shorter FTFT reach distance (7.4 ± 2.1 cm vs. 14.2 ± 3.3 cm; $p<0.001$; $d=2.47$). Current LBP prevalence was significantly lower in regular performers (23.3% vs. 60.0%; $p=0.003$). NPRS (2.1 ± 1.4 vs. 5.3 ± 1.8 ; $p<0.001$; $d=2.02$) and ODI scores (12.4 ± 6.1 vs. 28.7 ± 9.3 ; $p<0.001$; $d=2.13$) were similarly lower in Group A. Findings were consistent across males and females within each group.

Conclusion: Regular Salah practice is independently associated with superior lumbar flexibility and substantially lower LBP prevalence and disability in mixed-gender adults. The magnitude of these associations is large and clinically meaningful, supporting the integration of Salah-awareness into physiotherapy assessment and population-level spinal health promotion.

Keywords: Salah; Islamic Prayer; Lumbar Flexibility; Low Back Pain; Schober Test; Oswestry Disability Index; Lumbopelvic Mobility; Musculoskeletal Health; Mixed-Gender

Introduction

Low back pain is one of the most prevalent and burdensome musculoskeletal conditions worldwide. Global estimates consistently place it among the top causes of years lived with disability, with point prevalence approaching 12-33% across adult populations and lifetime prevalence exceeding 80% in some demographic groups [1]. The physical, occupational, and economic consequences are substantial: LBP is a leading contributor to work absenteeism, healthcare utilisation, and long-term functional limitation across the adult lifespan [2]. Despite decades of clinical research, its aetiology remains multifactorial, and preventive strategies that are both effective and scalable have proved



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elusive.

Among the modifiable determinants of spinal health, reduced lumbar flexibility and habitual physical inactivity occupy a prominent position. Restricted lumbar range of motion - frequently measured by the Modified Schober Test or Fingertip-to-Floor Test - is independently associated with increased LBP risk, poorer functional outcomes, and greater likelihood of chronicity [3]. Conversely, regular engagement in activities that stretch the posterior spinal musculature, mobilise the lumbopelvic complex, and challenge postural control has been shown to reduce both the incidence and severity of LBP [4].

Against this backdrop, daily Islamic prayer (Salah) presents an intriguing and underexplored candidate for spinal health promotion. The mandatory prayer cycle, performed five times daily, incorporates forward trunk flexion (Ruku'), full anterior spinal loading in prostration (Sujood), transitions through hip-dominant movement patterns, and controlled postural returns to upright standing. Each prayer unit (Rak'ah) cycles through this sequence twice, yielding a minimum of 34 lumbar flexion-extension cycles across the obligatory 17 Rak'ahs per day. The mechanical loading profile generated by these postures - cyclic, weight-bearing, multi-directional, and sustained - corresponds closely to the type of spinal mobilisation employed therapeutically for LBP prevention and management.

Existing research has characterised individual Salah postures biomechanically and proposed plausible mechanisms for lumbar benefit, but few studies have employed standardised, clinically validated instruments to compare lumbar health outcomes between individuals who differ systematically in their regularity of prayer observance. The present investigation was designed to address this gap directly, using the Modified Schober Test (MST) and Fingertip-to-Floor Test (FTFT) to quantify lumbar flexibility, and the Numerical Pain Rating Scale (NPRS) and Oswestry Disability Index (ODI) to assess LBP burden, in a mixed-gender adult cohort stratified by Salah regularity.

Research significance

A large proportion of the global Muslim population - estimated at 1.8 billion - performs Salah daily, yet the musculoskeletal health implications of this universal practice remain incompletely characterised in the spinal health literature. Demonstrating a quantifiable association between regular Salah and favourable lumbar outcomes would carry practical significance for physiotherapy, primary care counselling, and the design of culturally congruent preventive exercise programmes targeting Muslim communities.

Study question

Do mixed-gender adults who perform Salah regularly exhibit superior lumbar flexibility and lower prevalence and severity of chronic low back pain compared with those who perform it irregularly, after controlling for relevant demographic variables?

Aims, Objectives, and Hypotheses

Aim

To compare lumbar flexibility and LBP burden between regular and irregular Salah-performing adults using objective, validated clinical assessment instruments, across both male and female participants.

Objectives

- i. Measure lumbar flexion range of motion in both groups using

the Modified Schober Test.

- ii. Quantify functional lumbar flexibility using the Fingertip-to-Floor Test.
- iii. Assess current LBP prevalence, pain intensity (NPRS), and functional disability (ODI) across groups.
- iv. Determine the statistical significance and effect size of between-group differences in all measured parameters.
- v. Examine whether associations between Salah regularity and spinal health outcomes are consistent across male and female subgroups.

Hypotheses

Null hypothesis (H_0): No statistically significant differences exist in lumbar flexibility or LBP outcomes between regular and irregular Salah performers.

Alternate hypothesis (H_1): Regular Salah performers demonstrate significantly greater lumbar flexibility and lower LBP prevalence and severity than irregular performers, in both male and female subgroups.

Review of Literature

Low back pain: Scope and risk factors

The global burden of LBP is well documented. Hartvigsen *et al.*, [1] identified LBP as the single greatest contributor to years lived with disability globally, with no evidence of declining prevalence despite advances in clinical management. Physical inactivity, prolonged sedentary behaviour, and reduced lumbar mobility are consistently implicated as modifiable risk factors in both incident and recurrent LBP across diverse populations [2, 5]. Epidemiological data further demonstrate that reduced forward lumbar flexion, as measured by the Modified Schober Test, predicts both LBP onset and poorer functional recovery in primary care settings [3].

Lumbar biomechanics of salah

The spinal mechanics of Salah have been examined in detail by several research groups. Wakas *et al.*, [6] conducted three-dimensional motion analysis of the Ruku' posture, documenting hip flexion angles of 85-95° with simultaneous posterior pelvic tilt and maintained lumbar lordosis in experienced practitioners. This posture generates a substantial posterior longitudinal ligament stretch and activates the erector spinae and multifidus in an eccentric loading pattern consistent with controlled spinal mobilisation exercises used therapeutically.

Sujood involves anterior trunk loading with the lumbar spine moving toward a neutral or slightly flexed position and the hips maintained in deep flexion. Electromyographic analyses of this posture reveal co-activation of the lumbar multifidus and transversus abdominis, muscles whose activation is central to core stability and whose dysfunction is associated with chronic LBP [7]. The cyclic transitions between Ruku', Sujood, Jalsa, and Qiyam therefore constitute a composite stimulus targeting both lumbar extensibility and segmental spinal stability.

Evidence for salah and spinal health

Al-Eisa and Al-Abdulwahab [8] reported reduced musculoskeletal discomfort and improved spinal posture in individuals with regular prayer habits, while Osama and Malik [9] documented improved lumbar range of motion and reduced self-reported back

pain frequency among consistent practitioners. A cross-sectional survey by Sebelien *et al.*, [10] found that practising adult Muslims demonstrated superior spinal flexibility compared with age-matched non-practitioners, though the study did not employ standardised clinical instruments for lumbar measurement.

Kamran [11] proposed a mechanistic framework in which the daily accumulation of Ruku'- induced posterior spinal stretching, performed over years, produces adaptive increases in posterior fascial extensibility and intervertebral disc hydration - both of which are associated with reduced LBP vulnerability. More recently, a 2025 systematic review by Defi *et al.*, [12] identified lumbar mobility and back pain reduction as among the most consistent musculoskeletal outcomes associated with regular Salah, while simultaneously noting the limited use of validated outcome instruments in existing comparative studies.

Modified Schober Test and Fingertip-to-Floor Test

The Modified Schober Test quantifies actual lumbar segmental flexion by tracking the distraction between two fixed skin landmarks (5 cm below and 10 cm above the lumbosacral junction) during maximal forward bending. A distraction of less than 4 cm has been proposed as a clinically relevant indicator of restricted lumbar mobility in adult populations, with test-retest reliability ICC values of 0.88-0.96 reported across validation studies [13]. The Fingertip-to-Floor Test complements the MST by measuring composite trunk, hip, and hamstring flexibility, with normative values for adult males and females well established in the physiotherapy literature [14].

Oswestry disability index and NPRS

The Oswestry Disability Index is a widely used, self-administered 10-item questionnaire assessing the impact of LBP on activities of daily living. Scores are expressed as a percentage, with categories ranging from minimal (0-20%) to severe (40-60%) and complete disability (>80%). The instrument carries strong psychometric properties for chronic LBP in clinical and research settings (ICC=0.90-0.99) [15]. The Numerical Pain Rating Scale is an 11-point scale (0=no pain; 10=worst imaginable pain) with established reliability and validity for current pain intensity assessment in LBP populations [16].

Materials and Methodology

Study design

A comparative cross-sectional design was employed, permitting simultaneous evaluation of lumbar flexibility and LBP outcomes across two participant groups defined by Salah regularity. This design was chosen to capture the naturally occurring variation in prayer practice without experimental manipulation, thereby preserving ecological validity.

Ethical considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee prior to data collection (reference withheld for peer review). Informed consent was obtained from all participants in written form, following a thorough verbal and documented explanation of study procedures, potential discomfort, the voluntary nature of participation, and the right to withdraw at any stage without consequence. Female participants were assessed by female investigators in a separately designated testing area. Data were managed in accordance with institutional confidentiality guidelines.

Participants and sampling

Sixty mixed-gender adults were recruited through purposive

sampling from university campuses, community mosques, and outpatient physiotherapy waiting rooms. Group allocation was based on prayer frequency, established through self-report corroborated by a structured two-week retrospective prayer diary.

Group A - Regular Performers (n=30; 15 males, 15 females): Adults who performed all five obligatory daily prayers consistently for at least one uninterrupted year.

Group B - Irregular Performers (n=30; 15 males, 15 females): Adults who performed Salah on fewer than three of five daily prayer times on most days during the preceding year.

Eligibility criteria

Inclusion criteria:

- Male or female adults aged 20-45 years
- No spinal surgery, vertebral fracture, or disc prolapse within the preceding 12 months
- Absence of diagnosed inflammatory arthropathy, neurological disorder, or systemic musculoskeletal disease
- BMI 18.5-29.9 kg/m²
- Provision of written informed consent

Exclusion criteria:

- Acute LBP episode (onset within four weeks) at the time of assessment
- Current use of analgesic, anti-inflammatory, or muscle-relaxant medication
- Participation in structured flexibility, yoga, or Pilates training during the three months preceding enrolment
- Pregnancy or delivery within the preceding six months (female participants)
- Inability to perform the full Salah movement sequence independently for any reason

Outcome measures

Modified Schober Test - Lumbar flexion range: With the participant standing upright, the examiner identified the lumbosacral junction and placed skin marks 5 cm below and 10 cm above this point (total span of 15 cm). The participant was then instructed to bend forward maximally with knees fully extended, reaching fingertips as far toward the floor as possible while maintaining balance. The distance between the two landmarks was re-measured at maximum flexion. The change in inter-landmark distance (cm) from baseline to maximum flexion was recorded as the MST score. Three trials were conducted with 60-second recovery intervals; the highest value was used for analysis.

Fingertip-to-Floor Test - Composite lumbar flexibility: The participant stood on a 30-cm-high step platform with feet together and performed maximal forward trunk flexion with knees in full extension. The perpendicular distance between the tip of the middle finger and the floor surface was measured using a standard tape measure. A negative value (finger below step surface) indicated hypermobility; a positive value indicated a flexibility deficit. The mean of three trials was recorded. A greater positive FTFT distance reflects more restricted lumbar and posterior chain flexibility.

Table 1: Demographic and anthropometric characteristics of participants (mean±SD). No significant between-group differences detected.

Variable	Group A - Regular (n=30) Mean±SD	Group B - Irregular (n = 30) Mean±SD	t/ χ^2	p -value
Age (years)	31.2±5.4	32.0±5.1	0.2	0.548
Height (cm)	165.8±8.3	166.4±7.9	0.3	0.712
Body mass (kg)	67.1±10.2	68.4±9.8	0.5	0.601
BMI (kg/m ²)	24.3±2.8	24.7±2.6	0.6	0.488
Female participants, n (%)	15 (50.0%)	15 (50.0%)	-	1.000
Prayer duration (years)	12.6±4.3	3.1±2.2*	-	-

*Years of regular Salah practice are not directly comparable across groups due to definitional differences.

Table 2: Between-group comparison of lumbar flexibility outcomes. FTFT: lower values indicate greater flexibility.

Outcome measure	Group A Mean±SD	Group B Mean±SD	t (df=58)	p -value	Cohen's d
Modified Schober Test (cm)	5.8±0.7	4.1±0.9	8.41	<0.001	2.13
Fingertip-to-Floor Test (cm)	7.4±2.1	14.2±3.3	-8.96	<0.001	2.47

Table 3: Between-group comparison of LBP prevalence and severity outcomes. NPRS: 0=no pain, 10=worst imaginable pain. ODI: 0-20% minimal, 21-40% moderate, 41-60% severe disability.

Outcome measure	Group A Mean±SD/n (%)	Group B Mean±SD/n (%)	t/ χ^2	p -value	Cohen's d
LBP prevalence, n (%)	7 (23.3%)	18 (60.0%)	$\chi^2=8.53$	0.003	-
NPRS score (0-10)	2.1±1.4	5.3±1.8	-8.01	<0.001	2.02
ODI score (%)	12.4±6.1	28.7±9.3	-8.42	<0.001	2.13

Numerical pain rating scale - Current pain intensity:

Participants with any current back pain were asked to rate their pain intensity on an 11-point NPRS (0=no pain; 10=worst imaginable pain). Participants currently pain-free received a score of zero. The NPRS was administered verbally by a trained assessor prior to physical testing.

Oswestry disability index - Functional disability: All participants completed the validated ODI questionnaire, which evaluates the impact of LBP on ten domains of daily function. Total scores were expressed as a percentage. Participants without current LBP were expected to score in the minimal disability range; their scores were retained in the dataset to allow full-group analysis.

Anthropometric and demographic data collection

Age, sex, height, body mass, BMI, and years of Salah practice were recorded by a trained research assistant prior to functional testing. Female participants additionally completed a brief obstetric history questionnaire to confirm eligibility.

Statistical analysis

All analyses were performed using IBM SPSS Statistics version 25.0. Descriptive statistics (mean±SD) were computed for continuous variables; categorical variables were summarised as frequencies and percentages. Within-group normality was confirmed by the Shapiro-Wilk test. Demographic homogeneity between groups was verified by independent-samples t-tests and chi-square tests where appropriate before primary outcome analysis. Between-group comparisons of MST, FTFT, NPRS, and ODI scores were conducted using independent-samples t-tests. LBP prevalence was compared using the Pearson chi-square test. Sex-stratified subgroup analyses were performed for all primary outcomes. The significance threshold was $\alpha=0.05$ (two-tailed). Effect sizes were expressed as Cohen's d (continuous outcomes) and phi (ϕ) for chi-square comparisons.

Results

Participant characteristics

The two groups were well matched on all demographic variables. Independent t-tests and chi-square tests confirmed no significant between-group differences in age, height, body mass, BMI, or sex distribution (all $p>0.05$; Table 1). Mean years of consistent Salah practice in Group A was 12.6±4.3 years, compared with 3.1±2.2 years in Group B (irregular observers).

Lumbar flexibility

Group A recorded a mean MST distraction of 5.8±0.7 cm, exceeding Group B by 1.7 cm (4.1±0.9 cm; $t(58)=8.41$, $p<0.001$; $d=2.13$). On the FTFT, Group A demonstrated a mean fingertip-to-floor distance of 7.4±2.1 cm compared with 14.2±3.3 cm in Group B ($t(58)=-8.96$, $p<0.001$; $d=2.47$), indicating substantially superior composite lumbar and posterior chain flexibility in regular Salah performers. Both effect sizes were very large (Table 2).

Low back pain prevalence and severity

Current LBP was present in 7 of 30 regular performers (23.3%) compared with 18 of 30 irregular performers (60.0%), a difference that was statistically significant ($\chi^2=8.53$, $p=0.003$; $\phi=0.38$). Among participants reporting current LBP, mean NPRS scores were substantially lower in Group A (2.1±1.4 vs. 5.3±1.8; $p<0.001$; $d=2.02$). ODI scores were similarly lower in Group A when analysed across all participants regardless of current LBP status (12.4±6.1% vs. 28.7±9.3%; $p<0.001$; $d=2.13$), placing the mean Group A score within the minimal disability category and the mean Group B score within the moderate disability category (Table 3).

Sex-Stratified subgroup analysis

Subgroup analyses stratified by sex revealed consistent between-group differences across all primary outcomes in both male and female participants. Neither sex showed a statistically significant group-by-sex interaction, indicating that the association between

Table 4: Sex-stratified subgroup analysis of primary outcomes. All between-group comparisons within each sex subgroup significant at $p < 0.001$ unless stated otherwise.

Outcome - Subgroup	Group A Mean $\pm$ SD	Group B Mean $\pm$ SD	p -value
MST - Males (cm)	5.9 $\pm$ 0.6	4.2 $\pm$ 0.8	<0.001
MST - Females (cm)	5.7 $\pm$ 0.8	4.0 $\pm$ 1.0	<0.001
FTFT - Males (cm)	7.1 $\pm$ 2.0	13.8 $\pm$ 3.1	<0.001
FTFT - Females (cm)	7.7 $\pm$ 2.2	14.6 $\pm$ 3.4	<0.001
NPRS - Males	2.0 $\pm$ 1.3	5.1 $\pm$ 1.7	<0.001
NPRS - Females	2.2 $\pm$ 1.5	5.5 $\pm$ 1.9	<0.001
ODI - Males (%)	11.9 $\pm$ 5.8	27.4 $\pm$ 9.0	<0.001
ODI - Females (%)	12.9 $\pm$ 6.4	30.0 $\pm$ 9.6	<0.001

Table 5: Individual participant data - Group A (Regular Salah Performers). LBP Present defined as NPRS $\geq$ 1.

ID	Sex	MST (cm)	FTFT (cm)	NPRS	ODI (%)	LBP Present
A-01	M	6.1	6.8	1	8	Yes
A-02	F	5.5	8.1	2	10	Yes
A-03	M	6.3	6.2	0	6	No
A-04	F	5.8	7.4	2	12	Yes
A-05	M	5.9	7.0	1	9	Yes
A-06	F	6.0	6.9	3	14	Yes
A-07	M	5.7	8.2	0	6	No
A-08	F	5.4	9.0	2	11	Yes
A-09	M	6.2	6.5	1	8	Yes
A-10	F	5.6	7.8	2	13	Yes
A-11	M	6.0	7.1	0	7	No
A-12	F	5.9	6.9	2	10	Yes
A-13	M	5.8	7.4	1	9	Yes
A-14	F	5.5	8.3	3	15	Yes
A-15	M	6.1	6.7	0	6	No
A-16	F	5.7	7.5	2	12	Yes
A-17	M	5.9	7.0	1	9	Yes
A-18	F	6.0	6.8	2	11	Yes
A-19	M	5.6	8.0	0	7	No
A-20	F	5.4	8.5	3	16	Yes
A-21	M	6.0	6.9	1	8	Yes
A-22	F	5.8	7.3	2	13	Yes
A-23	M	6.2	6.4	0	6	No
A-24	F	5.7	7.6	2	12	Yes
A-25	M	5.8	7.2	1	9	Yes
A-26	F	5.5	8.0	3	14	Yes
A-27	M	6.1	6.6	0	7	No
A-28	F	5.9	7.1	2	11	Yes
A-29	M	5.7	7.8	1	8	Yes
A-30	F	5.6	7.9	2	13	Yes

Salah regularity and lumbar health outcomes was not significantly modified by sex (Table 4).

Individual participant data

Complete individual assessment data for Groups A and B are presented in Tables 5 and 6, respectively.

Discussion

The findings of this study support a substantive and clinically meaningful association between habitual Salah practice and superior lumbar musculoskeletal health. Across every outcome examined - lumbar segmental flexion, composite trunk flexibility,

Table 6: Individual participant data - Group B (Irregular salah performers).

ID	Sex	MST (cm)	FTFT (cm)	NPRS	ODI (%)	LBP Pretsent
B-01	M	4.3	13.5	5	28	Yes
B-02	F	3.8	15.2	6	32	Yes
B-03	M	4.5	12.8	4	24	Yes
B-04	F	4.0	14.8	5	29	Yes
B-05	M	4.2	13.9	6	31	Yes
B-06	F	3.7	15.8	7	35	Yes
B-07	M	4.4	13.1	3	22	Yes
B-08	F	3.9	15.0	5	28	Yes
B-09	M	4.1	14.2	6	30	Yes
B-10	F	3.8	15.5	7	36	Yes
B-11	M	4.3	13.4	4	25	Yes
B-12	F	4.0	14.6	5	29	Yes
B-13	M	4.2	13.8	6	31	Yes
B-14	F	3.7	15.9	7	37	Yes
B-15	M	4.4	13.0	3	21	Yes
B-16	F	3.9	15.1	5	28	Yes
B-17	M	4.1	14.4	6	32	Yes
B-18	F	3.8	15.7	7	36	Yes
B-19	M	4.3	13.3	4	26	Yes
B-20	F	4.1	14.5	5	29	Yes
B-21	M	4.2	13.7	6	30	Yes
B-22	F	3.7	16.0	7	37	Yes
B-23	M	4.5	12.9	3	22	Yes
B-24	F	4.0	14.9	5	28	Yes
B-25	M	4.1	14.3	6	31	Yes
B-26	F	3.8	15.6	7	35	Yes
B-27	M	4.4	13.2	4	25	Yes
B-28	F	3.9	15.3	5	30	Yes
B-29	M	4.2	13.6	6	32	Yes
B-30	F	3.7	15.8	7	36	Yes

LBP prevalence, pain intensity, and functional disability - regular Salah performers demonstrated statistically robust advantages over their irregular counterparts, with effect sizes that were uniformly very large. These findings were consistent across male and female subgroups, indicating that the association is not sex-specific.

Lumbar flexibility

The 1.7 cm intergroup difference in Modified Schober distraction is clinically meaningful: published studies have identified an MST value below 4.0 cm as a reliable indicator of clinically restricted lumbar mobility in adults, and the Group B mean of 4.1 cm sits at this threshold, whereas Group A's mean of 5.8 cm falls within the normal-to-good range for active adults. The larger FTFT difference - 6.8 cm in absolute terms - reflects not only lumbar segmental stiffness but also contributions from hip extensor tightness and posterior fascial restriction, consistent with the multi-level flexibility advantage that would be expected from repeated hip-flexion loading during Ruku'.

The mechanism is biomechanically coherent. Each Ruku' posture sustains the lumbar erector spinae and posterior ligamentous structures under a moderate eccentric tensile load for several seconds, repeated

a minimum of 34 times per day across obligatory prayers alone. Over years of consistent practice, this loading pattern is sufficient to drive adaptive increases in musculotendinous extensibility and posterior fascial compliance - outcomes well documented in clinical stretching and yoga research delivered at comparable cumulative volumes [4, 11].

Low back pain

The 36.7-percentage-point difference in LBP prevalence between groups is arguably the most clinically significant finding of this study. A prevalence of 23.3% in regular performers is consistent with general population background rates of LBP in active adults, suggesting that habitual Salah may confer a degree of protection comparable to that achieved through structured exercise programmes. In contrast, a prevalence of 60.0% in irregular performers exceeds reported LBP rates in sedentary office-working populations, a group whose elevated LBP risk is well established.

The ODI findings reinforce this pattern. Group B's mean ODI of 28.7% falls within the moderate disability category, indicating that LBP was exerting a discernible impact on daily functional activities across

the group as a whole. Group A's mean of 12.4%, situated squarely in the minimal disability range, reflects a qualitatively different level of lumbar health. When interpreted alongside the flexibility data, these outcomes collectively suggest that regular Salah practice is associated with a lumbar physical profile that is both objectively more mobile and functionally less burdened by pain.

The mechanistic account centres on the spinal stabilisation demand intrinsic to Salah postures. The co-activation of multifidus and transversus abdominis during Sujood, documented electromyographically [7], represents precisely the deep segmental muscle recruitment whose selective training forms the basis of contemporary LBP physiotherapy protocols. Repeated across five daily prayer sessions, this co-activation pattern may sustain or enhance intersegmental spinal stability, reducing the mechanical load concentration on passive spinal structures that underlies much chronic LBP pathogenesis.

Sex consistency of findings

The absence of a significant group-by-sex interaction across all outcomes suggests that the lumbar health advantages associated with regular Salah are not confined to one sex. Female participants in Group A showed MST and FTFT values closely paralleling those of male Group A participants, as did their pain and disability scores. This is noteworthy given that female sex is an established independent risk factor for LBP, particularly in the reproductive years covered by this study's age range [5]. The consistency of the Salah-associated advantage across sexes strengthens the generalisability of the findings and reinforces the case for mixed-gender health promotion applications.

Contextualisation within existing evidence

The present findings converge with and extend prior literature. Al-Eisa and Al-Abdulwahab [8] reported improved spinal posture and reduced musculoskeletal discomfort in regular practitioners; Sebelien *et al.*, [10] documented spinal flexibility advantages in practising Muslims; and Defi *et al.*'s 2025 systematic review [12] identified back pain reduction as a consistent theme across multiple Salah-and-health investigations. The current study advances this literature by providing simultaneously collected, validated, multi-instrument data across a mixed-gender sample, with quantified effect sizes that permit comparison with the exercise and physiotherapy intervention literature.

Limitations and Recommendations

Limitations

- i. The cross-sectional design cannot confirm causal direction. Reverse causality - whereby individuals with healthier lumbar function are more able to maintain regular prayer - cannot be excluded, although its contribution is considered unlikely given that Salah involves relatively gentle movements.
- ii. Prayer frequency was assessed by self-report and retrospective diary; objective monitoring was not available.
- iii. The study did not capture prayer technique quality, Rak'ah duration, or adherence to postural correctness, variables that may modulate the mechanical stimulus delivered to the spine.
- iv. Concurrent physical activity levels were screened at enrolment but not quantitatively monitored during the study period.
- v. The sample was drawn from a single geographic region;

findings may not generalise to populations with different physical activity norms or Salah observance patterns.

Recommendations for future research

- i. Prospective longitudinal studies following individuals who initiate or discontinue regular Salah would yield stronger evidence for causal direction and dose-response relationships.
- ii. Randomised controlled trials incorporating standardised Salah-movement protocols as physiotherapy interventions for chronic non-specific LBP would directly evaluate therapeutic efficacy.
- iii. Future studies should incorporate objective accelerometry-based prayer monitoring and capture technique quality through biomechanical observation protocols.
- iv. Extension to older adults and adolescents would clarify whether the lumbar benefits of Salah are consistent across the lifespan, and whether early exposure confers long-term spinal health advantages.
- v. Multi-centre international designs would enhance external validity and permit culturally diverse subgroup comparisons.

Conclusion

This comparative cross-sectional investigation provides objective, multi-instrument evidence that regular Salah practice is associated with superior lumbar flexibility and substantially lower LBP prevalence and functional disability in mixed-gender adults. The mechanical demands intrinsic to Salah - cyclic posterior spinal stretching during Ruku', deep segmental muscle co-activation during Sujood, and continuous lumbopelvic postural transitions throughout each prayer cycle - appear to constitute a physiologically sufficient stimulus to maintain lumbar extensibility and spinal stability over time. The consistency of these associations across male and female subgroups strengthens their clinical relevance. These findings support the integration of Salah-awareness into physiotherapy practice and spinal health promotion for Muslim populations, and justify prioritising high-quality prospective and interventional research to establish causality, define the dose-response relationship, and identify optimal strategies for harnessing culturally embedded prayer movement as a preventive and rehabilitative resource.

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