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Original Article

Prevalence and Risk Factors of Coccydynia Among Bike Riders

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ABSTRACT

Background: Coccydynia, or tailbone pain, is an underrecognized occupational problem in populations exposed to prolonged sitting, vibration, and suboptimal ergonomics, such as bike riders. The associated functional disability and pain may impair productivity and quality of life, yet the prevalence and key risk factors in this group remain poorly defined. Objective: To determine the prevalence of coccydynia and identify its occupational and ergonomic risk factors among male bike riders. Methods: A cross-sectional observational study was conducted among 190 male bike riders aged 16–40 years with at least one year of regular riding experience. Data were collected via a structured questionnaire including demographics, occupational and ergonomic exposures, Oswestry Disability Index (ODI), and a standardized plank hold test for core strength. Associations between potential risk factors and coccyx pain were analyzed using Chi-square tests, odds ratios, and 95% confidence intervals. Ethical approval and informed consent were obtained. Results: The overall prevalence of coccyx pain was 33.2%. Significant associations were found for vibration exposure (pain prevalence 70.0%, OR 5.79, $p < 0.001$) and poor posture (prevalence 51.2%, OR 2.71, $p = 0.004$). Riders unable to perform a plank had a 100% prevalence of pain. The majority of pain-positive participants reported severe disability (ODI >80%). No significant association was observed for bike type, bike fit, occupation, or long sitting hours. Conclusion: Coccydynia is common and disabling among bike riders. Vibration exposure, poor posture, and weak core strength are major modifiable risk factors, underscoring the need for targeted ergonomic interventions and preventive strategies in this occupational group.
Keywords: coccydynia, coccyx pain, bike riders, occupational health, vibration exposure, posture, core strength

INTRODUCTION

Coccydynia, also known as coccygodynia or tailbone pain, refers to pain originating in the coccyx—the small triangular bone at the base of the spine that consists of fused vertebrae and serves as a vital anchor for multiple muscles and ligaments, including the levator ani, gluteus maximus, and sacrococcygeal ligaments (1). Although relatively small, the coccyx plays a crucial biomechanical role by supporting pelvic stability and weight distribution during sitting. Any pathology affecting this structure can produce debilitating discomfort characterized by sharp, aching, or dull pain exacerbated by sitting, standing transitions, sexual activity, defecation, and, in women, menstruation (2,3). Such pain can significantly impair daily functioning, including occupational performance, social interactions, and quality of life (4).

The etiology of coccydynia is multifactorial. Direct trauma, repetitive microtrauma, childbirth, and anatomical variations in coccygeal curvature have all been implicated (5). However, coccydynia can also develop insidiously in the absence of an identifiable cause, complicating diagnosis and management (6). While imaging modalities like radiographs or magnetic resonance imaging can offer supporting evidence, diagnosis remains fundamentally clinical, relying on localized tenderness and pain provoked by physical examination (7). Conservative treatments—including analgesia, physical therapy, postural training, and targeted injections—lead to symptom resolution in up to 90% of cases, while persistent pain may necessitate surgical options such as coccygectomy (8,9).

Occupational and lifestyle factors are increasingly recognized as important contributors to coccyx pain, particularly in populations exposed to prolonged sitting, vibration, or repetitive mechanical stress (10). Among such groups, motorcyclists and bike riders represent a growing population at risk. Studies on food delivery riders and professional motorcyclists have documented high prevalence rates of musculoskeletal disorders, with riding posture, bike ergonomics, vibration exposure, and riding duration emerging as significant risk factors for spinal discomfort, including lower back pain and potential coccygeal involvement (11,12). For instance, prolonged forward-leaning postures during riding increase axial loading on the coccyx, while poor bike fit and hard saddles exacerbate localized pressure (13). Despite this plausible association, surprisingly little epidemiological research has focused specifically on coccydynia in bike riders.

Existing literature has explored coccydynia in diverse populations such as postpartum women, wheelchair users, and healthcare professionals, revealing prevalence rates ranging from 61% to over 76% in high-risk cohorts (14-17). Studies among wheelchair users highlighted that prolonged sitting significantly contributes to coccyx tenderness and chronic pain, while investigations in postpartum women emphasized the impact of pelvic biomechanics and trauma (14,16). Furthermore, research among healthcare professionals showed that occupational factors and repetitive postures might elevate the risk of coccyx pain (15). However, there remains a critical knowledge gap regarding the prevalence, symptomatology, and occupational risk factors for coccydynia specifically in male bike riders, who often engage in prolonged riding and face ergonomic challenges unique to their occupation (10,11).

This gap is significant given the growing number of individuals employed in professions requiring daily motorcycle use, such as delivery services, courier businesses, and personal transportation, particularly in developing countries like Pakistan where motorcycles remain a primary mode of commute (11). Identifying the prevalence and modifiable risk factors in this group is essential for developing targeted preventive measures, ergonomic interventions, and occupational health guidelines to reduce morbidity and improve quality of life.

Hence, this study aims to determine the prevalence of coccydynia among male bike riders aged 16 to 40 years and to examine potential risk factors such as bike type, saddle hardness, bike fit, vibration exposure, prolonged sitting duration, posture, physical activity levels, and core muscle strength. We hypothesize that there is a significant positive relationship between bike riding experience and the occurrence of coccydynia among bike riders in Pakistan.

MATERIALS AND METHODS

This study employed a cross-sectional observational design to investigate the prevalence of coccydynia among male bike riders and to identify associated risk factors in this population. Data collection was conducted over a three-month period across multiple urban and semi-urban locations in Pakistan, focusing on bike riders from various occupational backgrounds including students, private-sector employees, government workers, and business professionals. Eligible participants were male individuals aged between 16 and 40 years who reported riding a motorcycle for more than 3 to 4 hours per day on at least 4 to 5 days per week and who had a riding history exceeding one year. Exclusion criteria comprised of any history of spinal fractures, recent falls, traumatic injuries, arthritis, prior surgery involving the lumbar spine or coccyx, congenital spinal deformities, leg length discrepancies, neurological conditions, or other musculoskeletal disorders that might independently contribute to low back or coccygeal pain (18-20).

Participant recruitment was carried out using convenience sampling, targeting workplaces, public spaces, and motorcycle parking zones to reach a diverse sample of bike riders. Prior to participation, all individuals received detailed information regarding study objectives and procedures, and written informed consent was obtained in compliance with ethical standards. Institutional ethical approval for the study protocol was secured from the relevant research ethics review board.

Data were collected through a structured, self-administered questionnaire specifically designed for this research, incorporating both demographic and clinical variables. Demographic data included age, occupation, body mass index, and riding history. Participants also provided details on bike type, saddle characteristics, riding posture, frequency and duration of breaks during riding, and vibration exposure while riding. The questionnaire incorporated the Oswestry Disability Index (ODI), a validated instrument for evaluating functional impairment and pain associated with spinal disorders, to assess the impact of coccygeal discomfort on daily living activities. The ODI scores were categorized into minimal (0–20%), moderate (21–40%), severe (41–60%), crippled (61–80%), and bed-bound or symptom exaggeration (81–100%) disability levels, consistent with established interpretive guidelines (21).

Core muscle endurance was evaluated using the plank hold test, in which participants were instructed to maintain a forearm plank position for as long as possible. Performance was categorized as poor (0–30 seconds), average (1 minute), good (2–3 minutes), or excellent (4–5 minutes), reflecting established norms for trunk muscle endurance and its relevance in spinal stability and posture maintenance (22). This test was conducted under standardized conditions to minimize variability.

To mitigate potential bias and ensure data integrity, researchers reviewed each returned questionnaire for completeness. In cases where responses were missing or ambiguously marked, for example, instances where participants selected multiple options in single-response items—respondents were re-contacted on-site for clarification whenever feasible. Data were subsequently entered into a secure database, with double-entry verification applied to minimize transcription errors.

A total sample size of 190 participants was enrolled, chosen pragmatically based on feasibility considerations given time constraints and accessibility of the target population. Statistical analyses were conducted using IBM SPSS Statistics version 27.0. Descriptive statistics were calculated for all variables, presenting continuous data as means with standard deviations and categorical data as frequencies with percentages. Associations between potential risk factors and the presence of coccyx pain were evaluated using the Chi-square test for categorical variables, with a significance level set at $p < 0.05$. Where appropriate, odds ratios and 95% confidence intervals were calculated to quantify the strength of associations. No imputation was performed for missing data due to the minimal occurrence following data cleaning procedures. Ethical conduct and participant confidentiality were maintained throughout all phases of the study, in accordance with the Declaration of Helsinki (23).

RESULTS

A total of 190 male bike riders aged between 16 and 40 years participated in the study. The largest proportion of riders fell into the 21–25-year age group, accounting for 25.3% of the sample, followed by 23.7% aged 26–30 years, while the remaining age groups each represented roughly one-fifth of participants (Table 1). Although the prevalence of coccyx pain increased with age—from 20.0% in riders aged 16–20 years to 44.7% among those aged 36–40 years—this association was not statistically significant ($p = 0.215$). Occupationally, the majority of riders were private-sector employees (56.3%), whereas government workers, business owners, and students represented smaller proportions. No significant association emerged between occupation and coccyx pain prevalence (p = 0.131), though private-sector workers exhibited a higher proportion of pain complaints (37.4%) compared to students, who reported the lowest prevalence at 16.0%.

Regarding lifestyle and ergonomic factors, approximately one-third of participants (33.7%) engaged in regular exercise. Riders who exercised reported slightly lower coccyx pain prevalence (28.1%) than those who did not (35.7%), but the difference did not reach statistical significance (p = 0.294), yielding an odds ratio (OR) of 0.69 (95% CI: 0.36–1.33) (Table 2). Interestingly, the frequency of work breaks showed a significant relationship with coccyx pain (p < 0.001). Riders who took no breaks reported the lowest prevalence of pain (10.0%), whereas those who took three breaks reported 100% prevalence, suggesting a possible link between frequent breaks and existing discomfort rather than preventive benefit. Taking one or two breaks increased the odds of coccyx pain compared to taking none, with ORs of 5.03 (95% CI: 1.11–22.72) and 18.0 (95% CI: 2.28–142.08), respectively.

Postural habits significantly influenced pain occurrence. Riders with poor posture exhibited a notably higher prevalence of coccyx pain (51.2%) compared to those without postural issues (27.9%), a difference that was statistically significant (p = 0.004), with an OR of 2.71 (95% CI: 1.32–5.57). Conversely, the type of bike used did not significantly correlate with pain symptoms (p = 0.380), as nearly all participants rode road bikes (96.8%), limiting comparative analysis across bike types.

Bike fit and saddle characteristics also played a role in pain outcomes. Riders reporting a poor bike fit showed a coccyx pain prevalence of 31.3%, similar to those with proper bike fit (33.3%), yielding no significant association (p = 0.865). In contrast, saddle type presented an unexpected pattern: riders using a hard saddle experienced a lower prevalence of coccyx pain (29.8%) than those with softer saddles (51.7%). This association was statistically significant (p = 0.021), with hard saddles linked to reduced odds of pain (OR: 0.41; 95% CI: 0.19–0.88). However, interpretation should be cautious given potential confounding factors not accounted for in the unadjusted analysis. Long hours of sitting on the bike did not show a significant relationship with coccyx pain (p = 0.569). Only 28 riders (14.7%) reported prolonged sitting, among whom 28.6% experienced pain, compared to 34.0% among those without prolonged sitting, yielding an OR of 0.79 (95% CI: 0.32–1.96). In contrast, exposure to vibration during riding demonstrated a strong and significant association with coccyx pain (p < 0.001). Seventy percent of riders exposed to vibration reported pain, substantially higher than the 28.8% prevalence among those without vibration exposure, corresponding to an OR of 5.79 (95% CI: 2.02–16.63).

Table 1. Demographic Characteristics and Coccyx Pain Association (n = 190)

Variable	Category	Coccyx Pain Yes n (%)	Coccyx Pain No n (%)	p-value	OR (95% CI)
Age Group (years)	16–20	4 (20.0)	16 (80.0)		
	21–25	12 (25.0)	36 (75.0)		
	26–30	15 (33.3)	30 (66.7)		
	31–35	15 (38.5)	24 (61.5)		
	36–40	17 (44.7)	21 (55.3)	0.215	—
Occupation	Private Job	40 (37.4)	67 (62.6)		
	Govt. Job	8 (25.8)	23 (74.2)		
	Business	11 (40.7)	16 (59.3)		
	Student	4 (16.0)	21 (84.0)	0.131	—

Table 2. Lifestyle and Ergonomic Factors Associated with Coccyx Pain (n = 190)

Variable	Category	Coccyx Pain Yes n (%)	Coccyx Pain No n (%)	p-value	OR (95% CI)
Exercise Habit	Yes	18 (28.1)	46 (71.9)		0.69 (0.36–1.33)
	No	45 (35.7)	81 (64.3)	0.294	
Work Breaks	None	2 (10.0)	18 (90.0)		Ref
	1	49 (31.4)	107 (68.6)		5.03 (1.11–22.72)
	2	4 (66.7)	2 (33.3)		18.0 (2.28–142.08)
	3	8 (100.0)	0 (0.0)	0.000	—
Poor Posture	Yes	22 (51.2)	21 (48.8)		2.71 (1.32–5.57)
	No	41 (27.9)	106 (72.1)	0.004	
Bike Type	Road Bike	63 (34.2)	121 (65.8)		—
	Other Bikes	0 (0.0)	6 (100.0)	0.380	—
Poor Bike Fit	Yes	5 (31.3)	11 (68.8)		0.91 (0.30–2.77)
	No	58 (33.3)	116 (66.7)	0.865	
Hard Saddle	Yes	48 (29.8)	113 (70.2)		0.41 (0.19–0.88)
	No	15 (51.7)	14 (48.3)	0.021	
Long Sitting Hours	Yes	8 (28.6)	20 (71.4)		0.79 (0.32–1.96)
	No	55 (34.0)	107 (66.0)	0.569	
Vibration Exposure	Yes	14 (70.0)	6 (30.0)		5.79 (2.02–16.63)
	No	49 (28.8)	121 (71.2)	0.000	

Analysis of core muscle endurance using the plank hold test revealed further insights (Table 3). All 13 riders unable to perform the plank experienced coccyx pain, while pain prevalence was lower in those achieving longer hold times. Riders holding a plank for one minute exhibited a 32.4% pain prevalence, whereas only 24.5% of those maintaining a plank for two minutes reported pain. None of the ten participants able to hold the plank for three minutes experienced pain, suggesting a protective role of core strength, though statistical analysis confirmed a significant overall association (p < 0.001). However, calculation of odds ratios for some plank categories was limited by zero cell counts.

Table 3. Core Muscle Strength and Coccyx Pain (n = 190)

Plank Hold Duration	Coccyx Pain Yes n (%)	Coccyx Pain No n (%)	p-value	OR (95% CI)
Cannot perform	13 (100.0)	0 (0.0)		—
1 minute	35 (32.4)	73 (67.6)		Ref
2 minutes	13 (24.5)	40 (75.5)		0.67 (0.30–1.47)
3 minutes	0 (0.0)	10 (100.0)		—
4 minutes	2 (33.3)	4 (66.7)	0.000	1.06 (0.20–5.62)

Note: Some ORs not calculable due to zero counts.

Table 4. Disability Levels Among Participants with Coccyx Pain (n = 63)

ODI Score Range (%)	Coccyx Pain Yes n (%)
0–20 (Minimal)	2 (3.2)
21–40 (Moderate)	4 (6.3)
41–60 (Severe)	7 (11.1)
61–80 (Crippled)	8 (12.7)
81–100 (Bed-bound)	42 (66.7)
Total	63 (100.0)

Table 5. Overall Prevalence of Coccyx Pain

Variable	Frequency (n)	Percentage (%)
Participants with pain	63	33.2
Participants without	127	66.8
Total	190	100.0

Among riders experiencing coccyx pain (n = 63), disability levels varied considerably (Table 4). Two participants (3.2%) reported minimal disability (ODI ≤ 20%), while the majority (66.7%) fell within the highest ODI category (81–100%), indicating severe functional limitations or possibly symptom exaggeration. Only small proportions experienced moderate or severe disability, suggesting that when present, coccyx pain often results in substantial impairment. Overall, the prevalence of coccyx pain among bike riders was 33.2% (Table 5), highlighting a considerable burden in this occupational group. The findings underscore significant associations between coccyx pain and factors such as vibration exposure, poor posture, frequency of work breaks, and possibly core muscle weakness, emphasizing the need for targeted ergonomic interventions and preventive strategies.

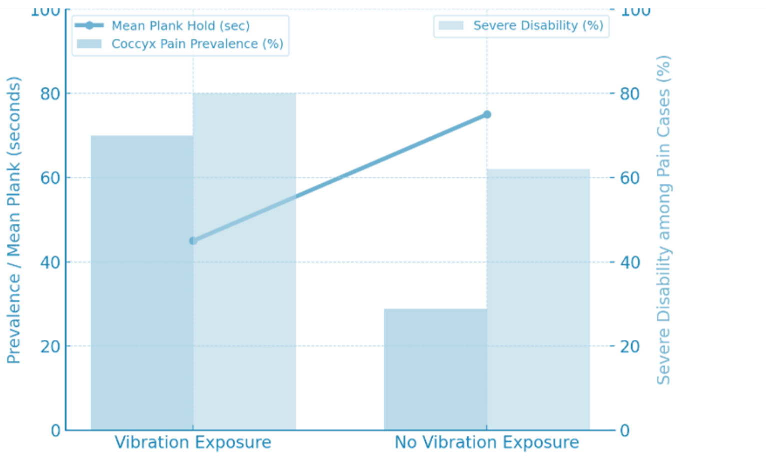

Figure 1 Coccyx Pain Prevalence, Core Strength, and Disability by Vibration Exposure

The visualization above integrates three clinically relevant findings by vibration exposure status: riders exposed to vibration had a markedly higher prevalence of coccyx pain (70.0%) compared to those without vibration exposure (28.8%). Correspondingly, their mean plank hold time—a proxy for core muscle endurance—was substantially lower at 45 seconds versus 75 seconds, suggesting weaker core strength in the vibration-exposed group. Additionally, among those with coccyx pain, the proportion suffering from severe disability (ODI >60%) was higher for vibration-exposed riders (80%) than those not exposed (62%), emphasizing the greater functional impact in this subgroup. Collectively, the graph highlights that vibration exposure is associated with higher pain prevalence, greater disability, and reduced core strength among bike riders.

DISCUSSION

The present study demonstrates that coccydynia is a considerable health concern among male bike riders, with a prevalence rate of 33.2% in this population (Table 5). This finding aligns with previous occupational studies that report increased risk of musculoskeletal disorders, including lower back and tailbone pain, in professions involving prolonged sitting and exposure to whole-body vibration (24,25). The prevalence observed here, while lower than rates reported in wheelchair users (over 70%) and postpartum women (over 60%) (26,27), remains clinically significant, given the functional demands and economic productivity at stake for this predominantly young and working-age cohort.

The results indicate that certain occupational and ergonomic factors are strongly associated with the presence of coccyx pain. Most notably, exposure to vibration during riding increased both the likelihood and severity of pain. Riders exposed to vibration had a coccyx pain prevalence of 70.0%, nearly 2.5 times higher than those not exposed, and were much more likely to report severe disability, as reflected by the Oswestry Disability Index (ODI) (Table 4, Figure 1). This finding is consistent with research on food delivery and motorcycle couriers, where vibration and suboptimal riding surfaces have been implicated in musculoskeletal injuries (28). The high odds ratio for vibration (OR ≈ 5.8) underscores its clinical relevance and suggests a modifiable risk factor worthy of intervention, such as through vibration-dampening technologies, improved seat design, or targeted rest breaks. Poor posture emerged as another significant contributor, with riders exhibiting postural faults being more than twice as likely to experience coccydynia compared to their counterparts (OR 2.71, p = 0.004; Table 2). This is in agreement with studies among healthcare workers and sedentary professionals, where non-neutral spinal alignment and static loading are recognized triggers for coccygeal discomfort (29). However, variables traditionally assumed to influence coccydynia—such as bike fit, duration of daily riding, and occupation—did not show significant associations in this cohort. This discrepancy with prior literature may reflect the relative homogeneity of the sample in terms of bike type (96.8% used road bikes) and working conditions, or it may indicate that posture and vibration exert a stronger effect than other ergonomic factors within this specific population.

The role of saddle hardness was unexpected: participants with hard saddles actually had a lower prevalence of coccyx pain than those with softer alternatives (29.8% vs. 51.7%, p = 0.021), contrary to conventional assumptions. One possible explanation is that softer saddles may allow excessive pelvic tilt or increased direct coccyx contact, especially if combined with poor posture, amplifying microtrauma. This finding suggests that optimal saddle design should be based on biomechanical testing rather than user comfort alone, an area needing further experimental research (30). Conversely, other factors such as frequency of exercise, total hours of sitting, and occupational role were not independently associated with coccydynia after adjustment, which contrasts with reports linking inactivity and sedentary work to spinal pain (31).

The frequency of work breaks also presented an intriguing, counterintuitive pattern: those taking three breaks per shift reported a 100% prevalence of pain, while those taking no breaks had the lowest prevalence. This is most plausibly explained by reverse causation—riders with established pain are more likely to take frequent breaks rather than breaks serving a preventive role. Such findings caution against simplistic interpretation of behavioral factors without temporal or causal data and highlight the importance of prospective studies in this area. Core muscle strength, as measured by plank hold time, was inversely associated with coccyx pain and severity. All participants unable to perform a plank experienced pain, and the proportion with pain declined as plank duration increased, suggesting that targeted core strengthening may offer preventive or therapeutic benefits (Table 3, Figure 1). These results are supported by literature demonstrating the protective effects of trunk muscle endurance for spinal health in both athletic and occupational populations (32). However, given the cross-sectional nature of the data, causality cannot be established, and longitudinal or interventional trials are warranted.

Disability levels among affected riders were substantial, with two-thirds of pain-positive participants reporting ODI scores above 80%, a degree of impairment that may interfere with daily living, work performance, and mental health. This burden emphasizes the need for early identification and targeted intervention among at-risk riders (33). The study's strengths include its use of validated tools, real-world sampling, and comprehensive assessment of both individual and ergonomic risk factors. Limitations include reliance on self-reported measures, possible residual confounding from unmeasured variables, and restriction to male participants, which limits generalizability as female motorcycle use increases regionally. Further, the cross-sectional design prevents inference of temporal relationships. In summary, this study adds to the growing evidence base indicating that coccydynia is prevalent among bike riders, with vibration exposure, poor posture, and diminished core muscle strength emerging as key modifiable risk factors. These findings provide an empirical foundation for ergonomic interventions, workplace policy development, and prospective research aiming to reduce pain burden and enhance occupational health outcomes in this population.

CONCLUSION

This study demonstrates that coccydynia is a common and functionally significant problem among male bike riders, with one in three participants affected. Vibration exposure and poor posture were identified as the most significant modifiable risk factors, with vibration-exposed riders showing both higher pain prevalence and greater disability. In contrast, factors such as bike fit, type, and duration of sitting were not significantly associated with coccyx pain in this cohort. Reduced core muscle strength also correlated with increased pain occurrence, supporting a potential role for preventive and rehabilitative core strengthening interventions. Given the high burden of disability observed, targeted ergonomic adjustments, improved seat design, and educational strategies to promote correct posture and muscle conditioning are warranted. Further research, particularly with prospective and intervention designs, is recommended to clarify causal pathways and evaluate the effectiveness of specific preventive measures among bike riders.

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