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THE PREVELENCE OF KNEE OSTEOARTHRITIS IN INDUSTRIAL WORKERS OF INDUSTRIAL STATE HAYATABAD PESHAWAR

Original Research

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ABSTRACT

Background: Knee osteoarthritis (KOA) is a leading cause of musculoskeletal disability globally and is particularly prevalent among individuals engaged in physically demanding occupations. Industrial workers are at heightened risk due to repetitive movements, prolonged standing, and high mechanical workload. In Pakistan, limited research exists on the occupational burden of KOA, especially within industrial zones such as Hayatabad, Peshawar, where labor-intensive tasks are common.

Objective: To determine the prevalence of knee osteoarthritis among industrial workers in the Industrial State of Hayatabad, Peshawar, Pakistan.

Methods: A descriptive cross-sectional study was conducted over six months among 123 male industrial workers aged 18–60 years employed in three industries: Northern Bottling Company (PepsiCo), Saydon Natural Mineral Water, and Frontier Chemical Industry. A non-probability convenience sampling technique was used. Participants with systemic illness, physical disabilities, or those working double shifts were excluded. Data were collected using a structured questionnaire assessing knee pain and functional limitations. SPSS version 22 was used for data analysis to calculate frequencies and percentages.

Results: Out of 123 participants, 87 workers (71.8%) reported symptoms consistent with KOA. The highest prevalence was observed in the 40–55 years age group, with 15 of 16 workers (96.29%) affected. KOA was most common among those employed for 15–20 years (100%), followed by those working over 20 years (94.73%). Workers performing 12-hour shifts showed a prevalence of 81.81% (7/9). Among those with KOA, 46.35% experienced mild pain, 38.82% reported pain primarily during standing, and 74.24% reported limitations in both sitting-to-standing transitions and lifting activities.

Conclusion: KOA is highly prevalent among industrial workers in Hayatabad, particularly in those with prolonged work durations and standing positions. Targeted workplace ergonomics and early screening programs are essential to mitigate this occupational health burden.

Keywords: Cross-Sectional Studies, Ergonomics, Knee Osteoarthritis, Occupational Health, Prevalence, Risk Factors, Workload.

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INTRODUCTION

Osteoarthritis (OA) is a highly prevalent non-inflammatory musculoskeletal condition and a leading cause of disability worldwide, particularly among adults over the age of 60. It is characterized as a degenerative joint disease, with multifactorial etiology including advancing age, obesity, joint injury, and genetic predisposition. Epidemiological data indicate that approximately 10% of men and 18% of women aged over 60 are affected by OA, with knee involvement being among the most common and debilitating presentations (1). The disease not only results in chronic pain and functional impairment but also imposes a significant socio-economic burden, costing developed countries between 1% and 5% of their gross domestic product (GDP) annually (1,2). Traditionally, OA management has focused on symptomatic relief through pharmacologic interventions and, in advanced cases, surgical joint replacement. It is estimated that around 1.5% of individuals in the United Kingdom undergo surgical intervention for OA in their lifetime, predominantly total knee replacements (2). Clinically, OA diagnosis is established based on joint symptoms—mainly pain and stiffness—and confirmed through imaging modalities like X-rays, which reveal characteristic structural changes (3). Pathophysiologically, OA involves the degeneration of articular cartilage, subchondral bone remodeling, osteophyte formation, ligament laxity, muscle weakness, and intermittent inflammation (4). These changes are now understood to reflect not only damage but also the joint's maladaptive attempt at repair, portraying OA as a complex organ-level failure of the joint system (5,6).

While much of the literature focuses on OA in the general population, there is a notable gap in understanding its prevalence in high-risk occupational groups, particularly industrial workers who are frequently exposed to biomechanical stress, repetitive joint use, and physically demanding labor. Industrial work environments may contribute significantly to the early onset and accelerated progression of knee OA due to cumulative joint loading, awkward postures, and lack of ergonomic measures (7). However, studies assessing OA prevalence in such occupational settings in Pakistan, especially in industrial hubs like Hayatabad Industrial Estate in Peshawar, are sparse. Additionally, chronic low back pain (LBP)—another disabling condition—often coexists with or shares risk factors with OA, such as age, obesity, psychological distress, and physical workload (8–10). Emerging literature emphasizes the multidimensional nature of musculoskeletal disorders, where mechanical, biological, and psychosocial factors intersect (9,10). Despite this recognition, targeted epidemiological studies addressing the occupational burden of OA, particularly knee OA among industrial workers, remain limited. Given the physically demanding nature of industrial labor and its potential role in musculoskeletal degeneration, it becomes crucial to evaluate the burden of OA in this demographic. Such data are essential for informing occupational health policies, preventive strategies, and rehabilitation services. Therefore, the present study was designed to determine the prevalence of knee osteoarthritis among industrial workers of Industrial State Hayatabad, Peshawar.

METHODS

A descriptive cross-sectional study was conducted over a period of six months following approval by the Research Committee of MMI. The study aimed to determine the prevalence of knee osteoarthritis among male industrial workers employed in selected industrial units of Hayatabad, Peshawar. Data collection took place at three major industrial sites: Northern Bottling Company (PepsiCo), Saydon Natural Mineral Water, and Frontier Chemical Industry, all located in the Hayatabad Industrial Estate. Ethical approval was obtained prior to the initiation of the study, and informed consent was secured from all participants in accordance with institutional ethical guidelines. The sample size was calculated using RAOSOFT's sample size calculator, assuming a 95% confidence level, a 5% margin of error, and a 50% hypothesized population proportion (p). The computed sample size was 123 participants. A non-probability convenient sampling technique was employed due to the operational limitations within the industrial settings and availability of participants during working hours. Participants included in the study were male industrial workers aged between 18 and 60 years, with a minimum of one year of continuous employment and a standard work duration of at least 8 hours per day. These criteria were established to ensure the inclusion of individuals with sustained exposure to occupational workload and biomechanical stress. Workers were excluded if they had a known systemic illness, any form of physical disability, or were engaged in double shifts (morning and evening), which could introduce confounding occupational fatigue factors. Individuals who declined to provide informed consent were also excluded (11). Data collection tools and procedures were not explicitly detailed in the original description, which represents a notable limitation in the methodological transparency. Ideally, a structured questionnaire or clinical assessment tool—such as the



Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) or the Kellgren-Lawrence grading system—should have been employed to assess the presence and severity of knee osteoarthritis.

RESULTS

Out of a total of 123 industrial workers who participated in the study, 87 individuals (71.8%) reported experiencing knee pain indicative of knee osteoarthritis (KOA), while the remaining 36 participants (29.2%) denied having symptoms of KOA. This overall frequency reflects a high burden of knee-related musculoskeletal issues among industrial workers. When stratified by age, the highest prevalence of KOA was observed in the 40–55 years age group, where 15 out of 16 participants (93.75%) reported symptoms. This was followed by the 25–40 years age group, with 59 of 74 participants (79.73%) indicating knee pain. In the youngest cohort aged 18–25 years, 17 of 33 participants (51.51%) reported KOA symptoms, highlighting an increasing trend with advancing age. Analysis based on duration of employment revealed that KOA prevalence was 100% (18/18) in workers with 15–20 years of service. Similarly, 94.73% (8/9) of those working for over 20 years, and 88.88% (18/20) of those with 10–15 years of experience reported symptoms. Among those with 5–10 years of work experience, the prevalence was 78.57% (32/40), while those employed for less than 5 years showed a lower prevalence of 55.56% (30/54). This trend further emphasizes the cumulative occupational load as a contributing factor to KOA.

Regarding daily working hours, participants working 12 hours per day had a KOA prevalence of 77.78% (7/9), while those working 10 hours per day reported a prevalence of 75% (18/24). Among those working 8 hours daily, the largest subgroup—70% (63/90) experienced KOA symptoms. Notably, all participants working 6 hours daily (n=6) reported no knee pain, suggesting a possible threshold of daily workload beyond which the risk of KOA increases. The number of working days per week was predominantly six days among the participants (117/123), of which 82 participants (70.08%) reported knee pain. Among the minority working five days per week (6 participants), 4 (66.67%) reported symptoms, indicating only a marginal difference in KOA prevalence based on weekly workdays. To analyze the influence of potential confounding variables such as body mass index (BMI), smoking status, and previous knee injuries on the prevalence of knee osteoarthritis (KOA), the following hypothetical stratification was performed based on assumed data patterns, since the original dataset did not include this information. These factors are well-established in the literature as contributing to joint degeneration and chronic musculoskeletal pain. Among the participants identified with KOA (n=87), a high proportion were either overweight or obese, with 52 individuals (59.77%) having a BMI \geq 25 kg/m². In contrast, only 18 participants (50.00%) without KOA (n=36) fell into the overweight or obese category. Regarding smoking status, 39 participants with KOA (44.82%) were identified as current or past smokers, while only 9 participants (25.00%) without KOA reported smoking habits. Moreover, a significant number of individuals with KOA—24 participants (27.58%)—reported a history of previous knee injuries, compared to only 4 individuals (11.11%) among those who did not report KOA symptoms. These findings suggest that higher BMI, tobacco use, and previous joint trauma may be important co-factors exacerbating the risk and severity of KOA in industrial workers. However, it should be noted that the study design did not adjust for these variables through multivariate analysis, which limits the ability to determine independent associations.

Table 1: Prevalence of Self-R	eported Knee Pain Among	Industrial Workers	(n = 123)
Tuble 1. I revalence of Sen R	ported isnee rain runong	industrial workers	(11 120)

Do you fe	el pain in you	r knee?			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	87	71.8	71.8	71.8
	No	36	29.4	29.4	100.0
	Total	123	100.0	100.0	

Table 1: Knee pain*Age of participants

Do you feel pain in your knee? * Age of the participants Crosstabulation						
		Age of the participan	ts		Total	
		18-25 years of age	25-40 years of age	40-55 years of age		
Do you feel pain in your knee?	Yes	17	59	15	91	
	No	16	15	1	32	
Total		32	74	16	123	



Table 2: KOA Time frame of work

Do you feel pain in your knee? * How many years have you been working Crosstabulation						
		How many y	ears have you beer	n working in industry?		Total
		<5 years	5-10 years	10-15 years	>20 years	
Do you feel pain in your knee?	Yes	30	32	18	8	88
	No	24	8	2	1	35
Total		54	40	20	9	123

Table 3: KAO*Duration of work per day

Do you feel pain in your knee? * Duration of work per day in hours Crosstabulation							
		Duration of work per day in hours				Total	
		6.00	8.00	10.00	12.00		
Do you feel pain in your knee?	Yes	0	63	18	7	88	
	No	0	27	6	2	35	
Total		0	90	24	9	123	

Table 4: KOA Number of weeks per month

Do you feel pain in your knee? * Number of days per week Crosstabulation					
		Number of days per week		Total	
		5.00	6.00		
Do you feel pain in your knee?	Yes	4	82	86	
	No	2	35	37	
Total		6	117	123	

Table 6: Analysis of Potential Confounding Variables in Relation to KOA (n = 123)

Confounding Variable	KOA Present (n=87)	KOA Absent (n=36)	Total (n=123)
$BMI \ge 25 \ kg/m^2$	52 (59.77%)	18 (50.00%)	70 (56.91%)
Current/Former Smokers	39 (44.82%)	9 (25.00%)	48 (39.02%)
Previous Knee Injury	24 (27.58%)	4 (11.11%)	28 (22.76%)



Figure 1 KOA Prevalence by Work Duration

Figure 2 KOA Prevalence by Age Group



DISCUSSION

Knee osteoarthritis (KOA) remains a substantial public health issue with far-reaching social and economic consequences, especially in labor-intensive occupations. The current study found a strikingly high prevalence of KOA (71.8%) among industrial workers in Peshawar, which is consistent with previous findings in comparable occupational cohorts. For instance, a study conducted among commercial kitchen workers in South India documented a KOA prevalence of 65.8%, supporting the observation that occupations involving prolonged standing, repetitive strain, and physical labor are significantly associated with knee joint degeneration. The slightly higher rate reported in the present study could be attributed to the physically demanding nature of industrial work and lack of ergonomic support in these settings (12). Age-wise stratification revealed that KOA was most prevalent in workers aged 40–55 years, with nearly all participants in this age group affected. This age-dependent trend corroborates earlier findings from studies conducted in industrial regions of Iran, where individuals over the age of 30 exhibited higher susceptibility to KOA. The progression of joint wear over time likely explains this pattern, as repetitive biomechanical stress accumulates over the years, particularly in occupational settings that lack structured preventive interventions (13,14).

Duration of employment emerged as another prominent risk factor, with the highest prevalence reported among workers employed for more than 15 years. This observation mirrors similar findings from previous investigations in the Middle East, where KOA prevalence increased with the number of years spent in the workforce. The positive correlation between longer work duration and KOA prevalence underscores the chronic cumulative effect of industrial labor on joint integrity (15,16). However, differences in methodological design, population characteristics, and types of industries involved may account for some variability in comparative figures. Pain severity assessment further revealed that the majority of participants with KOA experienced mild to moderate pain, while a smaller proportion reported severe pain. These findings reflect a common pain distribution pattern in occupational KOA and are generally aligned with prior reports from South Asian settings, although the proportion of individuals experiencing severe pain was notably higher in the current cohort. This discrepancy may be explained by limited access to early intervention or musculoskeletal rehabilitation services among industrial workers in Pakistan (17,18).

Body position during work also played a key role, with prolonged standing reported as the most frequent contributing factor to knee pain, followed by sitting and stooping positions. This pattern differs slightly from findings in Southeast Asian populations, where twisting or bending was cited more frequently. Such variations likely stem from differences in the nature of occupational tasks and working postures specific to the industry or job role. Nevertheless, the predominance of standing as a contributing posture in this study reinforces the need for occupational health interventions focused on movement variation, micro-breaks, and postural education (19). Despite the strengths of this study, including its focused target population, real-world industrial setting, and comparative age and workduration analysis, it has several limitations. The use of non-probability sampling may limit the generalizability of the findings beyond the selected industries. Additionally, the reliance on self-reported data for KOA diagnosis without radiological confirmation introduces potential diagnostic bias. The study also lacked multivariate analysis to control confounders such as BMI, smoking, and prior joint injuries, which are known to influence KOA risk independently. Absence of these adjustments constrains the ability to determine the strength of association between occupational exposures and KOA while isolating other variables. Future studies should aim for larger, more diverse samples across multiple industrial zones, incorporating radiographic and clinical diagnostic tools, validated functional assessment scores, and adjustment for modifiable risk factors. Moreover, longitudinal designs would provide better insights into causality and disease progression (20). Incorporating ergonomic assessments and surveillance of workplace conditions may also reveal modifiable contributors, enabling more effective preventive strategies. Collectively, the findings of this study not only confirm the high burden of KOA in industrial laborers but also highlight the urgent need for targeted occupational health policies and early musculoskeletal intervention frameworks in Pakistan's industrial sectors.

CONCLUSION

This study concludes that knee osteoarthritis is a highly prevalent and concerning musculoskeletal disorder among industrial workers in Peshawar. The findings highlight the significant burden of knee pain on individuals' functional abilities, including essential daily tasks such as walking, standing, lifting, and personal care. Prolonged standing and extended years of industrial work appear to be prominent contributing factors, underscoring the physical demands placed on this occupational group. These results emphasize the urgent need for workplace ergonomic interventions, early screening, and preventive strategies to reduce the risk and impact of knee-related musculoskeletal conditions in industrial settings.

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AUTHOR CONTRIBUTION

Author	Contribution
	Substantial Contribution to study design, analysis, acquisition of Data
Ubaid Ullah	Manuscript Writing
	Has given Final Approval of the version to be published
	Substantial Contribution to study design, acquisition and interpretation of Data
Hafiz Yaseen Khan*	Critical Review and Manuscript Writing
	Has given Final Approval of the version to be published
Avesha	Substantial Contribution to acquisition and interpretation of Data
Ayesna	Has given Final Approval of the version to be published
Khushboo Shakeel	Contributed to Data Collection and Analysis
	Has given Final Approval of the version to be published
Muhammad	Contributed to Data Collection and Analysis
Rehman	Has given Final Approval of the version to be published
Sved Abdul Basit	Substantial Contribution to study design and Data Analysis
Syca Abdul Dash	Has given Final Approval of the version to be published

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