

Original Research Article

The epidemiology of femoral head osteonecrosis in Bangladesh: a population-based study of etiological prevalence and risk factors

Neyamul Hasan*, Chowdhury Iqbal Mahmud, M. Ali Faisal, M. Naimur Rahman,
Raju Prasad Dey, Mohammad Zahidur Rahman Khan

Department of Orthopaedics, Bangladesh Medical University, Dhaka, Bangladesh

Received: 25 May 2026

Accepted: 16 June 2026

*Correspondence:

Dr. Neyamul Hasan,

E-mail: mnhasan.ms@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Femoral head osteonecrosis (FHO) is a debilitating condition leading to progressive hip joint destruction. Epidemiological data in Bangladesh are limited. This study aimed to describe the demographic profile, etiology, sex distribution, affected side, and residence patterns among patients with FHO.

Methods: A cross-sectional study was conducted on 122 patients diagnosed with FHO. Data were collected on age, sex, occupation, residence, etiology, and affected side. Descriptive statistics were used for frequency and percentage distributions. Associations between categorical variables, including sex and residence with etiology, were analyzed using Fisher's exact test.

Results: The study population comprised 72 males (59%) and 50 females (41%). The most affected age group was 18–29 years (42.6%). Rural patients accounted for 65.6% of the cohort. Idiopathic FHO was the predominant etiology (41%), followed by steroid-induced cases (27.9%) and trauma (13.1%). Ankylosing spondylitis, alcohol intake, sequelae of Perthes disease, and thalassemia were less common. Right hip involvement occurred in 44.3% of patients, left in 18%, and bilateral in 37.7%. Sex distribution showed idiopathic FHO was more frequent in males (41.7%), while steroid-induced cases were higher in females (44%), with a statistically significant association ($p < 0.001$). Residence did not show a significant association with etiology ($p = 0.288$).

Conclusions: Idiopathic and steroid-induced osteonecrosis are the leading causes of FHO in Bangladesh, with males more frequently affected and a high proportion of rural cases. The findings highlight the need for targeted awareness, early diagnosis, and management strategies, particularly in young adults and rural populations.

Keywords: Bangladesh, Epidemiology, Etiology, Femoral head osteonecrosis, Rural population, Sex distribution

INTRODUCTION

Osteonecrosis of the femoral head (ONFH), also known as avascular necrosis of the femoral head, is a debilitating orthopaedic condition characterized by the death of bone tissue due to disrupted blood supply, eventually leading to collapse of the femoral head and progressive hip joint dysfunction if untreated.^{1,2} This condition primarily affects adults in their 30s to 50s, significantly impacting quality of life and often necessitating surgical intervention such as core decompression or total hip replacement.^{2,3}

The etiology of ONFH is broadly categorized into traumatic and non-traumatic causes. Traumatic causes, such as femoral neck fractures and hip dislocations, directly impair the blood supply to the femoral head and are well-recognized precipitants of the disease.² Non-traumatic causes contribute to a substantial proportion of cases and are multifactorial in nature. Among these, chronic corticosteroid use and excessive alcohol consumption are consistently the most frequently implicated risk factors worldwide.^{4,5} Corticosteroid-associated ONFH arises due to complex pathophysiological changes including fat cell hypertrophy,

endothelial dysfunction, and impaired bone remodeling, although exact mechanisms remain incompletely understood.^{6,7} Alcohol-induced ONFH is similarly attributed to alterations in lipid metabolism and increased intraosseous pressure, leading to compromised vascular perfusion.⁴

Epidemiological studies suggest that the magnitude of risk associated with these non-traumatic factors is substantial. Recent research has shown that corticosteroid use and alcohol abuse often account for the majority of non-traumatic ONFH cases in large cohorts, with combined risk factors demonstrating multiplicative effects on disease incidence.⁷ Idiopathic ONFH, where no definitive cause is identified, still represents a significant portion of cases, underscoring gaps in understanding of individual susceptibility and genetic predispositions.⁸

Epidemiological data also reveal regional and demographic variations in the prevalence and etiology of ONFH. For example, large population studies from China indicate that alcohol-induced ONFH may predominate, whereas corticosteroid-related disease remains common across both sexes and age groups.⁸ Nationwide registry data from Japan demonstrate similar patterns with steroid-associated and alcohol-associated ONFH comprising sizeable proportions of cases.⁹ These findings highlight the global burden and complex interplay of risk factors contributing to ONFH.

In the context of Bangladesh and similar low-middle income settings, detailed population-specific epidemiological profiles are limited. Understanding the distribution of risk factors, demographic characteristics, and clinical features of ONFH is essential to inform prevention, early diagnosis, and targeted management strategies.

METHODS

This cross-sectional study was conducted at the Department of Orthopaedics, arthroscopy arthroplasty unit, Bangladesh Medical University, over a defined period from 1st July 2024 to 30th June 2025. A total of 122 patients diagnosed with femoral head osteonecrosis (FHO) were enrolled using consecutive sampling.

Inclusion criteria

Inclusion criteria were patients aged ≥ 18 years with radiologically confirmed FHO based on MRI or X-ray findings, and who provided informed consent.

Exclusion criteria

Exclusion criteria included patients with prior hip arthroplasty, concurrent severe systemic illness, or incomplete clinical records.

Data collection

Data were collected using a structured proforma capturing demographic information (age, sex, residence), clinical parameters (affected side, duration of symptoms), occupation, and etiology (idiopathic, steroid-induced, trauma, alcohol, ankylosing spondylitis, sequelae of Perthes disease, thalassemia). Radiological assessment of the hip was performed by a senior orthopaedic surgeon to confirm diagnosis and laterality of involvement. Patients were categorized according to age groups (18-29, 30-39, 40-49, 50-59, 60-69, 70-79), sex, residence (rural/urban), and affected side (right, left, bilateral).

Data analysis

Data were entered and analyzed using SPSS version 27. Descriptive statistics were reported as frequencies and percentages for categorical variables and means $\pm$ standard deviation for continuous variables. Associations between sex or residence and etiology were assessed using Fisher's exact test. A p-value < 0.05 was considered statistically significant.

Operational definitions

Femoral Head Osteonecrosis (FHO): Death of bone tissue in the femoral head confirmed by MRI or X-ray.

Idiopathic FHO: Cases with no identifiable cause despite clinical and radiological evaluation.

Steroid-Induced FHO: FHO occurring in patients with a history of prolonged corticosteroid therapy.

Traumatic FHO: Osteonecrosis following hip trauma, fracture, or dislocation.

Bilateral Involvement: Both left and right femoral heads affected simultaneously.

RESULTS

The table summarizes the distribution of participants across different age categories, with the largest group (42.6%) in the 18-29 age range, followed by equal representation (23%) in the 30-39 and 40-49 age categories. The remaining age groups, 50-59, 60-69, and 70-79, show smaller proportions of the population, reflecting the overall prevalence in this cohort (Figure 1).

The pie chart above illustrates the gender distribution of the study population, with 59% of participants identified as male and 41% as female. This distribution reflects the gender balance in the cohort for the study on Femoral Head Osteonecrosis. The total number of participants in the study is 122 (Figure 2).

This table cross-tabulates sex with occupation for the study population. Among males, the most common occupations

were business (44.4%) and farming (22.2%), followed by rickshawpuller (22.2%). For females, housewives made up 64% of the group, while garments workers accounted for 28%. The remaining occupations, such as service and business, had smaller proportions. Overall, 59% of participants were male, and 41% were female. The total sample size was 122 participants (Table 1).

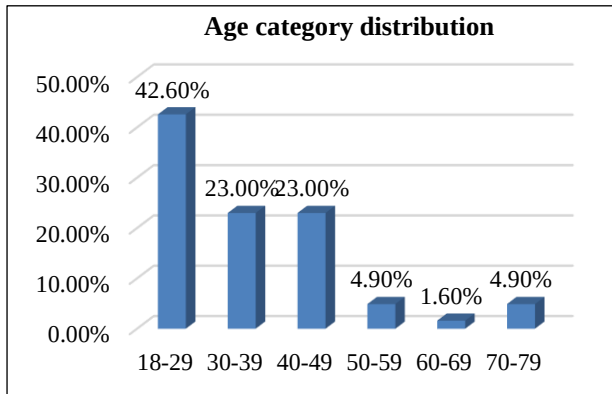


Figure 1: Age category distribution (n=122).

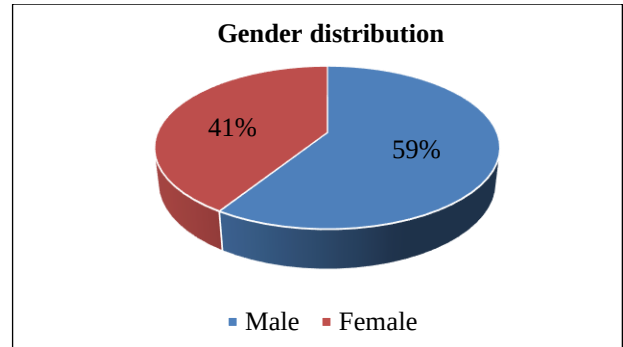


Figure 2: Gender distribution of the study population (n=122).

Among the 122 patients, the majority were from rural areas (80/122, 65.6%), while 42 patients (34.4%) resided in urban settings. The pie chart illustrates this distribution clearly. Rural patients accounted for nearly two-thirds of the cohort. Urban patients comprised just over one-third. This visual representation emphasizes the higher burden of femoral head osteonecrosis in rural populations (Figure 3).

Table 1: Distribution of occupation according to gender (n=122).

Sex	Housewife, N (%)	Garments worker, N (%)	Farmer, N (%)	Business, N (%)	Service, N (%)	Rickshawpuller, N (%)	Total, N (%)
Male	0 (0)	0 (0)	16 (22.2)	32 (44.4)	8 (11.1)	16 (22.2)	72 (59)
Female	32 (64)	14 (28)	0 (0)	0 (0)	4 (8)	0 (0)	50 (41)
Total	32 (26.2)	14 (11.5)	16 (13.1)	32 (26.2)	12 (9.8)	16 (13.1)	122 (100)

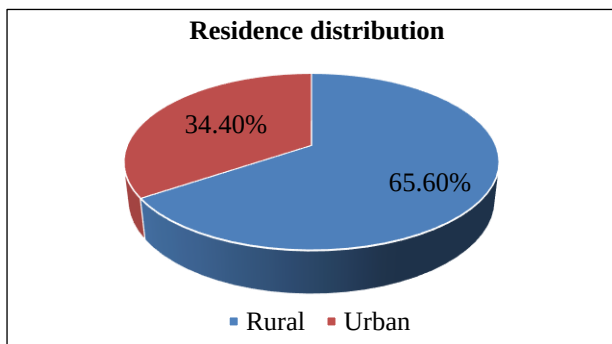


Figure 3: Residence distribution of the study population (n=122).

In this study of 122 patients with femoral head osteonecrosis, idiopathic causes were the most frequent, accounting for 41% of cases. Steroid use was identified in 27.9%, while trauma contributed to 13.1% of cases. Ankylosing spondylitis, alcohol intake, and sequelae of Perthes disease were less common, comprising 9.8%, 3.3%, and 3.3% respectively. Thalassema was rare, with only 1.6% of patients affected. These findings highlight the predominance of idiopathic and steroid-related osteonecrosis in the Bangladeshi population (Table 2).

Table 2: Etiology of femoral head osteonecrosis.

Etiology	Frequency (n)	Percent (%)
Idiopathic	50	41.0
Steroid	34	27.9
Trauma	16	13.1
Ankylosing spondylosis	12	9.8
Alcohol intake	4	3.3
Sequel of perthes disease	4	3.3
Thalassema	2	1.6
Total	122	100.0

Among the 122 patients with femoral head osteonecrosis, 72 (59.0%) were male and 50 (41.0%) were female. Idiopathic osteonecrosis was more common in males (30/72, 41.7%) than females (20/50, 40.0%). Steroid-induced cases were predominantly observed in females (22/50, 44.0%) compared to males (12/72, 16.7%). Trauma and alcohol-related osteonecrosis occurred mainly in males, while sequelae of Perthes disease were equally distributed. Ankylosing spondylitis affected only males in

this cohort. Fisher's exact test revealed a significant association between sex and etiology ($p < 0.001$) (Table 3).

Among the 122 patients, the right hip was affected in 54 cases (44.3%), the left in 22 cases (18.0%), and both hips in 46 cases (37.7%). Bilateral involvement was more common in males, whereas right- and left-sided involvement were distributed among both sexes.

Table 3: Sex distribution across aetiologies of femoral head osteonecrosis.

Sex	Idiopathic	Steroid	Thalassemia	Trauma	Ankylosing spondylosis	Alcohol intake	Sequel of perthes disease	Total
Male	30	12	2	10	12	4	2	72
Female	20	22	0	6	0	0	2	50
Total	50	34	2	16	12	4	4	122

Fisher Exact test p value= < 0.001

Table 4: Side of femoral head osteonecrosis involvement.

Side	Frequency (N)	Percent (%)
Right	54	44.3
Left	22	18.0
Bilateral	46	37.7
Total	122	100.0

Table 5: Residence distribution across aetiologies of femoral head osteonecrosis.

Residence	Idiopathic	Steroid	Thalassemia	Trauma	Ankylosing spondylosis	Alcohol intake	Sequel of perthes disease	Total
Rural	38	18	2	10	8	2	2	80
Urban	12	16	0	6	4	2	2	42
Total	50	34	2	16	12	4	4	122

Fisher's exact test ($p = 0.288$).

Among the 122 patients, 80 (65.6%) were from rural areas and 42 (34.4%) from urban settings. Idiopathic osteonecrosis was more frequent in rural patients (38/80, 47.5%) compared to urban patients (12/42, 28.6%). Steroid-related cases were slightly more common in urban patients (16/42, 38.1%) than rural (18/80, 22.5%). Trauma and ankylosing spondylitis were more common in rural areas, while alcohol intake and sequelae of Perthes disease were equally distributed. Overall, residence did not show a statistically significant association with osteonecrosis etiology ($p = 0.288$) (Table 5).

DISCUSSION

This study provides a detailed epidemiological profile of femoral head osteonecrosis (FHO) in a Bangladeshi cohort. Among the 122 patients, 72 (59%) were male and 50 (41%) female, demonstrating a male predominance consistent with global trends in ONFH.^{3,8} The most affected age group was 18-29 years (42.6%), highlighting the significant burden among young adults, which has also been observed in Chinese and South Korean populations.¹⁰

Idiopathic FHO was the most common etiology (41%), followed by steroid-induced cases (27.9%) and trauma

Idiopathic osteonecrosis predominantly affected the right side, while steroid-related cases were more frequent on the left. Trauma- and alcohol-induced cases were mainly right-sided. Ankylosing spondylitis affected the right hip exclusively. Overall, the affected side distribution highlights a notable proportion of bilateral cases in this Bangladeshi cohort (Table 4).

(13.1%). Steroid-associated ONFH was disproportionately observed in females (44% vs 16.7% in males), showing a statistically significant association ($p < 0.001$). This finding aligns with previous studies describing corticosteroid exposure as a key non-traumatic risk factor for FHO due to lipid metabolism disturbances and vascular compromise.^{6,7,11} Trauma- and alcohol-related cases were more frequent in males, which is consistent with prior observations on activity-related risk.^{1,4}

The distribution of affected hips showed right hip involvement in 44.3%, left in 18%, and bilateral in 37.7%. Bilateral involvement was more common among males, while idiopathic and steroid-related cases were frequently bilateral, as reported in previous epidemiological analyses.^{7,11,12}

Although 65.6% of patients were from rural areas, residence did not significantly influence etiology ($p = 0.288$), indicating that risk exposures such as steroid use and trauma are independent of urban-rural residence, similar to patterns reported in Japanese and South Korean registries.^{9,10} The natural history and progression of femoral head osteonecrosis have been well-described, showing that early-stage disease can remain asymptomatic

but often progresses to subchondral collapse without timely intervention.¹³

The findings underscore the predominance of idiopathic and steroid-induced FHO in Bangladesh, the male preponderance, and the high frequency of bilateral disease. These results highlight the importance of early detection and risk factor management, particularly in young adults exposed to corticosteroids.^{6,7,14} Understanding local epidemiology will aid clinicians in targeting preventive measures, optimizing early diagnosis, and guiding therapeutic strategies.^{1,5,13,15} The study's single-center, cross-sectional design and relatively small sample size limit generalizability and preclude assessment of causal relationships. Additionally, reliance on self-reported histories and incomplete data on steroid dose, alcohol intake, and comorbidities may affect the accuracy of risk factor analysis.

CONCLUSION

Idiopathic and steroid-induced femoral head osteonecrosis are the predominant causes of FHO in the Bangladeshi population. Males are more frequently affected, and young adults (18-29 years) represent the largest affected age group. Bilateral involvement is common, particularly in non-traumatic cases. Rural patients constitute the majority, though residence does not significantly influence etiology. Early identification, risk factor management, and targeted awareness are essential to prevent progression and optimize outcomes.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Rezus E, Tamba BI, Badescu MC, Popescu D, Bratoiu I. Osteonecrosis of the femoral head in patients with hypercoagulability from pathophysiology to therapeutic implications. *Int J Mol Sci*. 2021;22(13):6801.
2. MSD Manuals. MSD Manual Professional Version. 2025. Available at: <https://www.msdmanuals.com>. Accessed on 24 May 2026.
3. Buddhiraju A, Khanuja HS, Hegde V, Sequeira SB, Mont MA, Jones LC. Epidemiology, management, and systematic review of surgical trends for patients who have osteonecrosis of the femoral head. *J Arthroplasty*. 2025;40(10):S112-S119.e1.
4. StatPearls. Femoral head avascular necrosis. StatPearls Publishing; 2023.
5. Ma T, Wang C, Zhang J, Peng J. Research progress in the pathogenesis of hormone induced femoral head necrosis based on microvessels. *J Orthop Surg Res*. 2024;19(1):265.
6. Zhang J, Cao J, Liu Y, Zhao H. Advances in the pathogenesis of steroid associated osteonecrosis of the femoral head. *Biomolecules*. 2024;14(6):667.
7. Birla V, Vaish A, Vaishya R. Risk factors and pathogenesis of steroid-induced osteonecrosis of femoral head: a scoping review. *J Clin Orthop Trauma*. 2021;23:101643.
8. Liu W, Yue J, Guo X, Wang R, Fu H. Epidemiological investigation and diagnostic analysis of osteonecrosis of the femoral head in three northeastern provinces of China. *J Orthop Surg Res*. 2024;19(1):292.
9. Sato R, Ando W, Fukushima W, Sakai T, Hamada H, Takao M, et al. Epidemiological study of osteonecrosis of the femoral head using the national registry of designated intractable diseases in Japan. *Mod Rheumatol*. 2022;32(4):808-14.
10. Kang JS, Rhyu K. Epidemiology of osteonecrosis of the femoral head in South Korea. *BMC Musculoskelet Disord*. 2024;25:110.
11. Mont MA, Jones LC, Hungerford DS. Nontraumatic osteonecrosis of the femoral head. *J Bone Joint Surg Am*. 2020;102(5):434-42.
12. Kerachian MA, Srivastava K, Séguin C. Glucocorticoids and osteonecrosis. *J Orthop Res*. 2015;33(6):845-54.
13. Assouline-Dayana Y, Chang C, Greenspan A, Shoenfeld Y, Gershwin ME. Pathogenesis and natural history of osteonecrosis. *Semin Arthritis Rheum*. 2018;48(1):1-8.
14. Moya-Angeler J, Gianakos AL, Villa JC, Ni A, Lane JM. Current concepts on osteonecrosis of the femoral head. *World J Orthop*. 2019;10(6):211-27.
15. Park JW, Kim HS, Lee YK, Koo KH. Osteonecrosis of the Femoral Head:: Etiology, Pathogenesis, Natural History, and ARCO Staging. *Biol Orthoped J*. 2021;3(SP1):e28-34.

Cite this article as: Hasan N, Mahmud CI, Faisal MA, Rahman MN, Dey RP, Khan MZR. The epidemiology of femoral head osteonecrosis in Bangladesh: a population-based study of etiological prevalence and risk factors. *Int J Res Med Sci* 2026;14:3753-7.