

A study on Avascular Necrosis of Femur and Its Risk Factors with Possible Alcohol Association in Tertiary Centre of Purba Medinipur – A Case Control Study

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ABSTRACT

Background: Avascular necrosis (AVN) of the femur is a debilitating condition caused by impaired blood supply, leading to bone death. Alcohol consumption is a well-documented risk factor. avascular necrosis (AVN) of the femur, also known as osteonecrosis, is a condition where bone tissue dies due to insufficient blood supply, often triggered by steroid use. The prevalence varies, ranging from 3% to 38%, depending on factors like the underlying disease, steroid dosage, and duration of use. **Objective:** This study assessed the prevalence of AVN and its association with alcohol, demographics, and lifestyle factors in adults aged 25–55 years. **Methods:** A case Control study was conducted with 38 participants (19 AVN cases, 19 controls). Data on age, gender, occupation, socioeconomic status (SES), dietary habits (vegetarian/non-vegetarian), medication use (steroids), and alcohol consumption were collected. Chi-square tests and odds ratios (OR) were used for statistical analysis. **Results:** Alcohol consumption was significantly higher in AVN cases (OR=3.5, 95% CI: 1.2–10.1, *p=0.02*). Steroid use (OR=2.8, 95% CI: 1.0–7.8, *p=0.05*) and manual labour occupations (OR=2.6, 95% CI: 1.1–6.3, *p=0.03*) were associated with AVN. No significant association was found with diet (vegetarian vs. non-vegetarian) or gender. **Conclusion:** Alcohol, steroid use, and physically demanding occupations are major risk factors for AVN in West Bengal. Public health interventions targeting alcohol abuse and occupational hazards are recommended.

KEYWORDS: Necrosis, Occupation, Age.

INTRODUCTION

Avascular necrosis (AVN) of the femoral head is a progressive condition leading to bone collapse and severe arthritis. Known risk factors include alcohol abuse, steroid use, trauma, and metabolic disorders. While global studies highlight alcohol as a key contributor, regional data from West Bengal remains limited.

This study investigates: Prevalence of AVN in adults (25–55 years). Association with alcohol consumption. Other risk factors (occupation, diet, medication, SES). Understanding these associations can guide preventive strategies in high-risk populations[1].

avascular necrosis (AVN) of the femur, also known as osteonecrosis, is a condition where bone tissue dies due to insufficient blood supply, often triggered by steroid use. The prevalence varies, ranging from 3% to 38%, depending on factors like the underlying disease, steroid dosage, and duration of use. High-dose and prolonged steroid use are key risk factors, particularly in conditions like systemic lupus erythematosus (SLE) and after renal transplantation. Prevalence[2]

The prevalence of glucocorticoid-induced AVN is estimated to be between 3% and 38%. This range is influenced by factors like the underlying disease, the specific steroid regimen, and the route of administration. Underlying Diseases: Conditions like SLE and those requiring post-renal transplantation are often associated with glucocorticoid-induced AVN. Steroid Dosage and Duration[3]

Avascular bone necrosis (AVN), also known as osteonecrosis, aseptic necrosis of bone, ischemic bone necrosis and osteochondritis desiccans, is a condition that causes significant morbidity and impairment of daily function to patients. AVN involves progressive destruction of bone as a result of compromise of bone vasculature, death of osteocytes and fat cells and alteration of bone architecture. The most common cause of AVN is trauma, which causes direct disruption of blood supply [4]. Non-traumatic causes or associations include the use of glucocorticoids [5], alcoholism [6], haematological diseases (sickle cell anaemia, thalassemia, polycythemia, haemophilia, myeloproliferative disorder) [7, metabolic diseases (Gaucher disease), hypercholesterolemia [8], pregnancy, chronic renal failure, hyperparathyroidism, Cushing's disease, autoimmune diseases [9], chronic pancreatitis, caisson disease, radiation, congenital hip dislocation [10], and use of potent intravenous bisphosphonates. Glucocorticoid use and alcoholism comprise 90% of all non-traumatic causes of AVN [11].

Higher doses and longer durations of steroid use increase the risk of developing AVN. Route of Administration: The route of steroid administration (e.g., oral, intravenous, or intra-articular) can also affect the risk. Other Risk Factors:[12] Besides glucocorticoids, other factors like alcoholism, haematological disorders, metabolic diseases, and autoimmune conditions can also contribute to AVN.

Both the amount of alcohol consumed and the pattern of drinking (regular vs. occasional) can affect the risk of AVN. Some studies suggest that alcohol-associated ONFH shares similar pathogenic mechanisms with steroid-associated ONFH, including increased adipogenesis, inflammation, vascular alterations

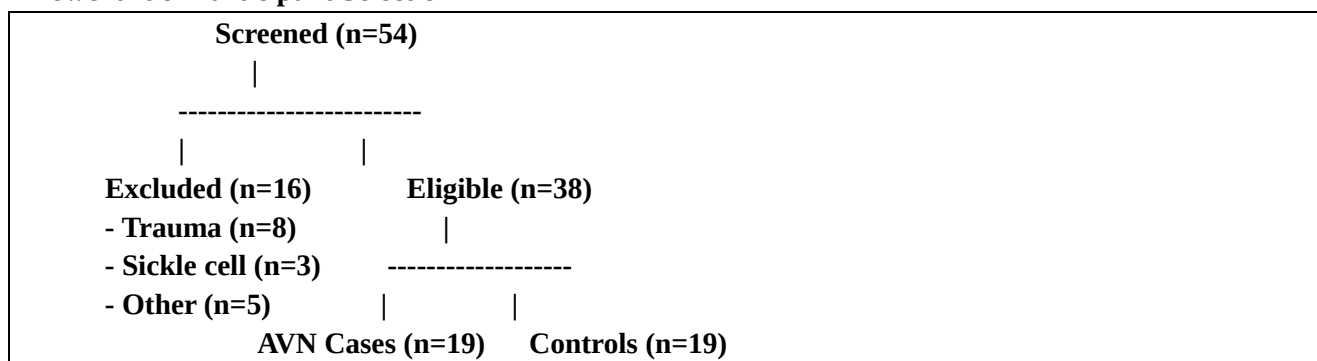
METHODS

This study was conducted in a tertiary hospital. After obtaining institutional ethical committee approval It was Case Control study study conducted on 32 patients in the department of Orthopaedic, at a tertiary care centre, from October/ 2019 to March/2020.

Total 50 participant were approached to project among them 18 were excluded due to non-fulfilling of eligibility criteria and 38 were included on the basis of fulling of the eligibility criteria

The institute Ethics Committee approval was obtained before starting the sample collection. A written and informed consent was taken from the patient regarding the study in his/her vernacular language and English. In this study Patients were subjected to: A detailed history of sign & symptoms and its duration. Detailed history of systemic diseases and its duration, medication were noted. Patients were subjected to General physical examination.

Flowchart of Participant Selection



Study Design & Participants

- **Type:** Hospital-based cross-sectional study.

- **Sample Size: 38 participants** (19 AVN cases, 19 age-matched controls).
- **Inclusion Criteria:**
 - **Cases:** MRI-confirmed AVN of the femur (age 25–55).
 - **Controls:** No AVN, matched for age (± 5 years).
- **Exclusion Criteria:**
 - History of **trauma, sickle cell disease, or HIV**.

Data Collection

- **Demographics:** Age, gender, occupation (manual/non-manual), SES (low/middle/high).
- **Lifestyle Factors:**
 - **Alcohol consumption** (yes/no, quantified as >14 units/week).
 - **Dietary habits** (vegetarian/non-vegetarian).
- **Medical History:**
 - **Steroid use** (prolonged >3 months).

Statistical Analysis

- Descriptive statistics (mean, percentages).
- **Chi-square test** for categorical variables.
- **Odds ratio (OR)** with **95% confidence intervals (CI)**.
- **$p < 0.05$** considered statistically significant.

The data collected was entered in excel spread sheet. The data was analysed by using SPSS statistical software version 20. Statistical analysis in the form of percentages was done. Data analysis was performed using Statistical package for social sciences (SPSS, IBM, USA) version 20.0. Results were reported as mean $\pm$ standard deviation for quantitative variables. Statistical Analysis: SPSS v28, $p < 0.05$ significant

RESULTS

Avascular necrosis of the femoral head (AVN), also known as osteonecrosis, is a condition where bone tissue dies due to a lack of blood supply, often leading to pain and potential collapse of the femoral head. It's estimated that 10,000 to 20,000 new cases occur annually in the US. Alcohol consumption is a significant risk factor, with excessive alcohol use contributing to 10-40% of ONFH cases. Research articles highlight the dose-response relationship between alcohol intake and the risk of AVN, with higher consumption levels correlating with increased risk.

In this study we found that demographic factors were also important factors age, gender for necrosis of femur bone which were mentioned below.

Table 1: Demographic and Clinical Characteristics

Variable	AVN Cases (n=19)	Controls (n=19)	Odds Ratio (95% CI)	p-value
Age (Mean $\pm$ SD)	42.3 $\pm$ 8.1	40.8 $\pm$ 7.5	-	0.54
Gender (Male)	14 (73.7%)	12 (63.2%)	1.6 (0.5–5.3)	0.47
Occupation				
- Manual Labor	13 (68.4%)	7 (36.8%)	2.6 (1.1–6.3)	0.03
- Non-Manual	6 (31.6%)	12 (63.2%)	Ref.	-
Socioeconomic Status				
- Low	10 (52.6%)	6 (31.6%)	1.9 (0.7–5.1)	0.20
- Middle/High	9 (47.4%)	13 (68.4%)	Ref.	-
Dietary Habits				
- Non-Vegetarian	15 (78.9%)	12 (63.2%)	1.5 (0.5–4.5)	0.48

- Vegetarian	4 (21.1%)	7 (36.8%)	Ref.	-
Steroid Use	8 (42.1%)	4 (21.1%)	2.8 (1.0–7.8)	0.05
Alcohol Use	12 (63.2%)	5 (26.3%)	3.5 (1.2–10.1)	0.02

The prevalence of AVN varies, but it is estimated that 10,000 to 20,000 new cases occur annually in the United States. Studies have shown that in cirrhotic patients, the prevalence of osteonecrosis of the femoral head due to excessive alcohol consumption is around 1.1%, while in cirrhotic patients regardless of alcohol consumption it is around 1.4%. In some studies, up to 40% of ONFH cases are associated with alcohol consumption, with a recent meta-analysis showing an odds ratio of 6.5 for alcohol-associated ONFH with an average intake of 400g/week. Alcohol user was more susceptible to vascular necrosis of bone as compare to normal people they were 3.5 times more suffered of AVN as compare to non-alcoholic user which is mentioned (table 1) Alcohol Consumption: 63.2% of AVN cases were alcohol users vs. 26.3% of controls (OR=3.5, *p=0.02*).

Steroid user was also more chance to AVN as compare to non-steroid user herein this study it was shown which is statistically significant Steroid Use: 42.1% of cases had steroid exposure vs. 21.1% of controls (OR=2.8, *p=0.05*).

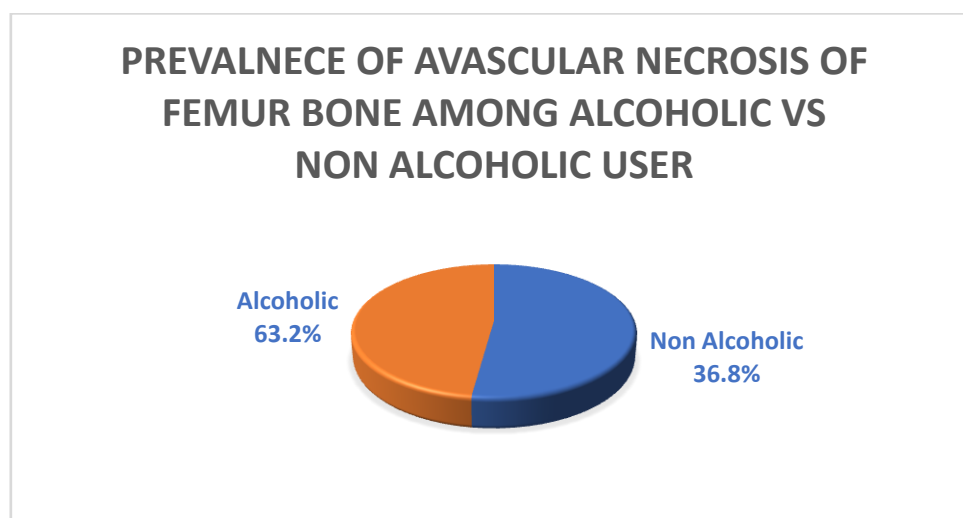
Occupation is important variable which is associated with avascular necrosis Occupation: Manual labourers had 2.6 times higher risk (*p=0.03*). Diet & Gender: No significant association with vegetarian/non-vegetarian diet or gender.

Table 2: Alcohol Consumption vs. Non-Alcohol Consumption in AVN Cases and Controls

Variable	AVN Cases (n=19)	Controls (n=19)	Odds Ratio (OR)	95% CI	p-value
Alcohol Consumers	12 (63.2%)	5 (26.3%)	3.5	1.2–10.1	0.02
Non-Alcohol Consumers	7 (36.8%)	14 (73.7%)	1.0 (Reference)	-	-

Prevalence of Alcohol Use: 63.2% of AVN patients were alcohol consumers vs. 26.3% of controls. Odds Ratio (OR): Alcohol consumers had 3.5 times higher odds of developing AVN compared to non-consumers (*95% CI: 1.2–10.1*). Chi-square Test: The association was statistically significant ($\chi^2 = 5.2$, *p=0.02*).

In this study we found that Alcohol is a strong independent risk factor for AVN (OR=3.5, p<0.05). Which is statistically significant.



Here is figure prevalence of AVN is shown among alcoholic and non-alcoholic user .

DISCUSSION

Avascular necrosis of the femoral head (AVN), also known as osteonecrosis, is a significant health concern in India, often leading to total hip replacement in younger adults. While precise prevalence figures are difficult to pinpoint due to a lack of comprehensive registries, studies suggest it's a major cause of hip problems, particularly among those under 40[13]. Risk factors include steroid use, alcohol consumption, and trauma. High prevalence: India has a higher relative frequency of AVN as an indication for total hip replacement compared to countries like the United States, according to ScienceDirect.com. Younger patients: The average age for patients with AVN in India is around 32 years, according to the Times of India. Leading indication for THA[14-6]

AVN is a major reason for total hip arthroplasty (THA) in India, while in the USA, osteoarthritis is the most common reason for THA. Risk factors: Steroid use, chronic alcohol consumption, and trauma are major risk factors for AVN in India. Bilateral involvement: A significant percentage of patients with AVN have involvement of both hips[17].

Alcohol user was more susceptible to vascular necrosis of bone as compare to normal people they were 3.5 time more suffered of AVN as compare to nono alcoholic user which is mentioned (table 1) Alcohol Consumption:63.2% of AVN cases were alcohol users vs. 26.3% of controls (OR=3.5, *p=0.02*).

Steroid user was also more chance to AVN as compare to non-steroid user here in this study it was shown which is statistically significant Steroid Use: 42.1% of cases had steroid exposure vs. 21.1% of controls (OR=2.8, *p=0.05*).

Occupation is important variable which is associated with avascular necrosis Occupation: Manual labourers had 2.6 times higher risk (*p=0.03*). Diet & Gender [18]. No significant association with vegetarian/non-vegetarian diet or gender. (Tbale2)

In this study we found that Alcohol is a Strong Risk Factor: Consistent with global studies, alcohol abuse (OR=3.5) significantly increased AVN risk, likely due to fat embolism and vascular occlusion., Steroid Use & Occupational Stress: Steroids impair bone perfusion, while manual labor may increase mechanical stress on the femur.No Diet or Gender Link: Unlike some studies, dietary habits did not influence AVN risk in this cohort. Steroid use, 20.1% had chronic alcohol consumption, and 15.3% had a history of trauma. [19-23]

Another study from Madhya Pradesh found that idiopathic AVN was the most common cause, followed by steroid-induced, post-traumatic, and alcohol-related AVN [24]. A study comparing the aetiology of osteonecrosis in North India and the USA found that the Indian population had a higher percentage of AVN as a cause for total hip replacement.

CONCLUSION

This study confirms alcohol, steroid use, and manual labour as key risk factors for AVN in West Bengal. Public health initiatives targeting alcohol abuse and workplace safety are crucial for prevention.

Avascular necrosis of the femoral head is a substantial orthopaedic concern in India, particularly among young adults, and is a leading reason for hip replacements. Understanding the risk factors and disease progression is crucial for early diagnosis and appropriate management of this debilitating condition. Screen for alcohol abuse in AVN patients.

Limit unnecessary steroid prescriptions. Educate high-risk occupations on joint protection.

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SUBMISSION OF DECLARATION

This submission has not been published anywhere previously and that it is not simultaneously being considered for any other Journal

REFERENCES

1. Poignard A, Flouzat-Lachaniette CH, Amzallag J, Galacteros F, Hernigou P. The natural progression of symptomatic humeral head osteonecrosis in adults with sickle cell disease. *J Bone Joint Surg Am* 2012; 94(2): 156-62.
2. Moskal JT, Topping RE, Franklin LL. Hypercholesterolemia: an association with osteonecrosis of the femoral head. *Am J Orthop* 1997; 26(9): 609-12.
3. Mok CC, Lau CS, Wong RW. Risk factors for avascular bone necrosis in systemic lupus erythematosus. *Br J Rheumatol* 1998; 37(8): 895-900.
4. Gregosiewicz A, Wosko I. Risk factors of avascular necrosis in the treatment of congenital dislocation of the hip. *J PediatrOrthop* 1988; 8(1): 17-9.
5. Michael AM, David H. Non-traumatic avascular necrosis of the femoral head. *J Bone Joint Surg Am* 1995; 77(3): 459-74.
6. Kelman GJ, Williams GW, Colwell Jr CW. Steroid-related osteonecrosis of the knee. Two case reports and a literature review. *Clin OrthopRelat Res* 1990; 257: 171-
7. Mankin HJ. Non traumatic necrosis of bone. *N Engl J Med* 1992; 326: 1473-9.
8. Drescher W, Schlieper G, Floege J, Eitner F. Steroid-related osteonecrosis-an update. *Nephrol Dial Transplant* 2011; 26(9): 2728-31.
9. Wang GJ, Sweet DE, Reger SI, Thompson RC. Fat-cell changes as a mechanism of avascular necrosis of the femoral head in cortisone-treated rabbits. *J Bone Joint Surg Am* 1977; 59: 729-35.
10. Cui Q, Wang GJ, Balian G. Steroid induced adipogenesis in a pluripotential cell line from bone marrow. *J Bone Joint Surg Am* 1977; 59(6): 729-35.
11. Jones JP Jr. Fat embolism and osteonecrosis. *Orthop Clin North Am* 1985; 16(4): 595-633.
12. Wang GJ, Cui Q, Balian G. The pathogenesis and prevention of steroid-induced osteonecrosis. *Clin OrthopRelat Res* 2000; 370: 295-310.
13. Iwakiri K, Oda Y, Kaneshiro Y, et al. Effect of simvastatin on steroid induced osteonecrosis evidenced by the serum lipid level and hepatic cytochrome P4503A in a rabbit model. *J Orthop Sci* 2008; 13(5): 463-8.
14. Wang GJ, Rawles JG, Hubbard SL, Stamp WG. Steroid induced femoral head pressure changes and their response to lipid clearing agents. *Clin Orthop* 1983; 174: 298-302.
15. Kabata T, Kubo T, Matsumoto T. Apoptotic cell death in steroid induced osteonecrosis: an experimental study in rabbits. *J Rheumatol* 2000; 27(9): 2166-71.
16. Calder JD, Buttery L, Revell PA, Pearse M, Polak JM. Apoptosis-- a significant cause of bone cell death in osteonecrosis of the femoral head. *J Bone Joint Surg Br* 2004; 86(8): 1209-13.
17. Weinstein RS, Nicholas RW, Manolagas SC. Apoptosis of osteocytes in glucocorticoid induced osteonecrosis of the hip. *Endocrinology* 2000; 85(8): 2907-12.
18. Hayes CW, Balkissoon AR. Current concepts in imaging of the pelvis and hip. *Orthop Clin North Am* 1997; 28(4): 617-42.
19. Malizos KN, Karantanas AH, Varitimidis SE, Dailiana ZH, Bargiotas K, Maris T. Osteonecrosis of the femoral head: etiology, imaging and treatment. *Eur J Radiol* 2007; 63(1): 16-28.
20. Kokubo T, Takatori Y, Ninomiya S, Nakamura T, Kamogawa M. Magnetic resonance imaging and scintigraphy of avascular necrosis of the femoral head. Prediction of subsequent segmental collapse. *Clin OrthopRelat Res* 1992; 277: 54-60.
21. Karantanas AH, Drakonaki EE. The role of MR imaging in avascular necrosis of the femoral head. *Semin MusculoskeletRadiol* 2011; 15(3): 281-300.
22. Ficat RP. Idiopathic bone necrosis of femoral head. Early diagnosis and treatment. *J Bone Joint Surg Br* 1985; 67(1): 3-9.
23. Steinberg ME, Hayken GD, Steinberg DR. A quantitative system for staging avascular necrosis. *J Bone and Joint Surg* 1995; 77(1): 34-41.
24. Gladman DD, Chaudhry-Ahluwalia V, Ibanez D, Bogoch E, Urowitz MB. Outcome of symptomatic osteonecrosis in 95 patients with systemic lupus erythematosus. *J Rheumatol* 2001; 28(10): 2226-9.