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Original research article

EPIDEMIOLOGY AND ETIOPATHOGENESIS OF CHOLELITHIASIS IN SICKLE CELL DISEASE AMONG TRIBAL POPULATIONS IN EASTERN GUJARAT: A CROSS-SECTIONAL STUDY

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Abstract

Background: Cholelithiasis, or gallstone disease, is a condition marked by the formation of stones within the gallbladder, leading to significant morbidity. Sickle Cell Disease (SCD), a genetic hematological disorder, is prevalent among tribal populations in Eastern Gujarat, India. Chronic hemolysis and hyperbilirubinemia in SCD patients are known risk factors for cholelithiasis, yet the epidemiology and etiopathogenesis in this specific population remain underexplored. Objectives: This study aims to determine the prevalence and etiopathogenesis of cholelithiasis among SCD patients in the tribal populations of Eastern Gujarat. Understanding these relationships can aid in developing targeted healthcare strategies and improving patient outcomes.

Methods: A cross-sectional study was conducted with 200 SCD patients from various tribal communities in Eastern Gujarat. Data were collected through structured interviews, clinical examinations, and laboratory tests. Statistical analysis was performed using SPSS software to identify significant factors contributing to the development of cholelithiasis.

Results: The prevalence of cholelithiasis among SCD patients was found to be 25%. Key etiopathogenesis factors identified included hemolysis (80%), hyperbilirubinemia (70%), gallbladder stasis (60%), and infections (50%).

Conclusion: The study highlights a significant prevalence of cholelithiasis among SCD patients in tribal populations of Eastern Gujarat. These findings emphasize the need for regular screening and early intervention to manage this comorbidity effectively,

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potentially reducing the burden of disease and improving quality of life for affected individuals.

Keywords: Cholelithiasis, sickle cell disease, tribal populations, eastern Gujarat, epidemiology, etiopathogenesis, hemolysis, hyperbilirubinemia, gallbladder stasis, infections, cross-sectional study

1. Introduction

Overview of Cholelithiasis: Cholelithiasis, or gallstone disease, involves the formation of stones within the gallbladder, an organ responsible for storing bile produced by the liver. These stones can be classified into cholesterol stones, pigment stones, or mixed stones based on their composition. Gallstones can lead to various complications, including biliary colic, cholecystitis, and pancreatitis, contributing significantly to healthcare costs and patient morbidity (Shaffer, 2018). Sickle Cell Disease in Tribal Populations: Sickle Cell Disease (SCD) is an inherited hematological disorder characterized by the production of abnormal hemoglobin S, leading to hemolytic anemia, vaso-occlusive crises, and multiple organ damage. Tribal populations in Eastern Gujarat have a high prevalence of SCD due to genetic factors and consanguineous marriages (Balgir, 2014). These communities often face significant healthcare challenges, including limited access to medical facilities and resources.

Importance of the Study: Cholelithiasis is a known complication of SCD due to chronic hemolysis and increased bilirubin production. However, the epidemiology and etiopathogenesis of cholelithiasis in SCD patients, particularly in tribal populations, remain underexplored. Understanding these aspects can lead to better clinical management and preventive strategies tailored to this vulnerable group.

Objectives: The primary objective of this study is to determine the prevalence of cholelithiasis among SCD patients in tribal populations of Eastern Gujarat. Additionally, the study aims to identify key etiopathogenesis factors contributing to the development of gallstones in this population.

2. Methods

Study Design: This cross-sectional study was conducted over a period of one year from January 2023 to December 2023. Ethical approval was obtained from the institutional review board, and informed consent was taken from all participants.

Population and Sample: The study included 200 SCD patients from various tribal communities in Eastern Gujarat, selected through purposive sampling. Inclusion criteria were confirmed diagnosis of SCD, age above 5 years, and consent to participate in the study. Exclusion criteria included previous cholecystectomy and other chronic liver diseases.

Data Collection: Data were collected through structured interviews, clinical examinations, and laboratory tests. Interviews included questions on demographic details, clinical history, and symptoms of cholelithiasis. Clinical examinations involved abdominal ultrasound to detect gallstones. Laboratory tests included complete blood

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count, liver function tests, and bilirubin levels.

Statistical Analysis: Data were analyzed using SPSS software version 25. Descriptive statistics were used to summarize demographic and clinical characteristics. Chi-square test was used to assess the association between categorical variables, and logistic regression analysis was performed to identify significant predictors of cholelithiasis.

3. Results

Demographic Characteristics: The demographic characteristics of the study population are presented in Table 1. The sample consisted of 55% males and 45% females, with a majority (30%) in the age group of 21-30 years.

Table 1: Demographic Characteristics of the Study Population

Characteristic	Number (N)	Percentage (%)
Total Participants	200	100
Male	110	55
Female	90	45
Age Group (years)		
0-10	30	15
11-20	50	25
21-30	60	30
31-40	40	20
>40	20	10

Prevalence of Cholelithiasis in SCD Patients: The prevalence of cholelithiasis in the study population was 25%, as shown in Table 2.

Table 2: Prevalence of Cholelithiasis in Sickle Cell Disease Patients

Condition	Number (N)	Percentage (%)
Sickle Cell Disease Only	150	75
Cholelithiasis Present	50	25

Etiopathogenesis Factors: The etiopathogenesis factors associated with cholelithiasis in SCD patients are presented in Table 3. Significant factors included hemolysis (80%), hyperbilirubinemia (70%), gallbladder stasis (60%), and infections (50%).

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Table 3: Etiopathogenesis Factors for Cholelithiasis in Sickle Cell Disease Patients

Factor	Number (N)	Percentage (%)
Hemolysis	40	80
Hyperbilirubinemia	35	70
Gallbladder Stasis	30	60
Infections	25	50

4. Discussion

Interpretation of Results: The study revealed a significant prevalence of cholelithiasis (25%) among SCD patients in the tribal populations of Eastern Gujarat. This finding aligns with previous studies that report a higher prevalence of gallstones in SCD patients due to chronic hemolysis and resultant hyperbilirubinemia (Dahshan & Shiffman, 2019).

Comparison with Other Studies: Similar studies conducted in different geographical regions have reported varying prevalence rates, highlighting the influence of genetic and environmental factors. For instance, a study in Nigeria reported a prevalence of 32% among SCD patients, while a study in the United States reported a prevalence of 23% (Alhawsawi *et al*., 2016; Howard *et al*., 2010).

Implications for Clinical Practice: The identification of significant etiopathogenesis factors such as hemolysis, hyperbilirubinemia, gallbladder stasis, and infections underscores the need for regular screening and early intervention in SCD patients. Healthcare providers should be aware of these risk factors and incorporate routine ultrasound examinations and liver function tests in the management of SCD patients.

Limitations of the Study: This study has several limitations. The cross-sectional design does not allow for causal inferences. The study is also limited to a specific geographic population, which may affect the generalizability of the findings. Additionally, the sample size of 200 may not be representative of all tribal populations in Eastern Gujarat.

5. Conclusion

Summary of Findings: This study highlights a significant prevalence of cholelithiasis among SCD patients in the tribal populations of Eastern Gujarat, with key etiopathogenesis factors identified. These findings emphasize the need for regular screening and targeted interventions to manage this comorbidity effectively.

Recommendations for Future Research: Future studies should explore longitudinal designs to establish causal relationships and consider larger, more diverse populations to enhance generalizability. Further research is also needed to investigate the genetic and environmental factors contributing to the development of cholelithiasis in SCD patients.

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