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Genetic Factors Induced Immune Response in Inflammatory Bowel Disease

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ABSTRACT

Introduction: Inflammatory Bowel Disease (IBD), a chronic condition marked by inflammation in the gastrointestinal tract, arises from a multifaceted interaction between genetic predispositions, alterations in the gut microbiota, and immune system dysfunction. The global prevalence of IBD has increased significantly with a rising incidence in developing countries like India. Key genetic loci, such as Nucleotide-binding Oligomerisation Domain-Containing Protein 2 (NOD2), Interleukin-23 Receptor (IL23R), and Autophagy related 16 Like 1 (ATG16L1), play significant roles in increasing disease susceptibility by emphasising the critical influence of host immune regulation.

Aim: Despite substantial research, the exact causes of IBD remain poorly understood. The purpose of this comprehensive analysis is to systematically explore the genetic factors triggering immune response IBD.

Materials and Methods: The search strategy in the databases-PubMed, Scopus, Google Scholar, Web of Science involved a combination of Boolean operators (AND, OR) to refine search terms related to IBD, genetic susceptibility, immune response, and Genome-Wide Association Studies (GWAS). Both observational and experimental studies published from 2000 to 2024 that focused on genetic factors and immune responses in IBD in various geographical settings were included in the study. Of 2150 articles obtained, 370 articles met the inclusion criteria and included in this study.

Results: Numerous genetic factors contribute to IBD susceptibility, with several susceptibility loci identified through GWAS. Among the most well-established genetic factors are: NOD - involved in bacterial recognition and immune response; IL23 - involved in T-cell differentiation and immune regulation; and ATG16L1- involved in autophagy and pathogen clearance.

Conclusion: This comprehensive analysis provides an updated understanding of the genetic-immune axis in the context of IBD pathogenesis. These findings emphasise the intertwined roles of microbial and genetic elements in shaping the immune mechanisms underlying IBD.

Implications: Recent advancements in sequencing technologies and multi-omics integration have shed light on the intricate relationships between host genetic factors and immune pathways. Emerging therapeutic strategies, such as microbiota-targeted treatments, immune-modulating therapies, and precision medicine, present promising opportunities for personalised IBD management.

Keywords: Autophagy related 16 like 1, Interleukin-23 receptor, Nucleotide-binding oligomerisation domain-containing protein 2

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