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## **The Silent Threat: Unveiling the Genetics of Thalassaemia in India: A Comprehensive Review**

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**ABSTRACT** Globally prevalent inherited disorders like beta-thalassaemia and sickle-cell anaemia are of great concern within the ethnic cultural diversity in India. The main objective is to review the underlying genetic aspects, especially the molecular basis of thalassaemia and to gain a comprehensive understanding of the genetic landscape of thalassaemia, highlighting the regional variations, diagnostic challenges and their implications for public health interventions. Databases like Google Scholar, Web of Science and Scopus were used to search for relevant papers that align with the study's objectives. This review collates knowledge available about the molecular genetics, prevalence, and diagnoses challenges of thalassaemia, especially South India. The review highlights the very high frequency of carriers of b-thalassaemia among tribal populations with the role consanguineous marriages play in increasing the prevalence of mutations. Besides, the review highlights the economic burden on families faced with thalassaemia, as thus far, treatment has been unaffordable for most. Gene therapy and molecular diagnosis hold promise for offering better hope for improvement in patients, while their access and affordability remain the most daunting challenge. Preventive strategies include comprehensive carrier screening, genetic counselling, and public health interventions aimed at reducing disease incidence and economic impact. The conclusion is drawn with implications for health policy and establishing new diagnostic technologies in resource-poor settings.