

Peer Review

Review of: "The Rural–Urban Divide: Insights from Immuno–Genetic Profiles and Implications for Health"

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This study investigates the genetic and immunological differences between rural and urban populations in Sudan, focusing on the impact of environmental and geographic factors on health and disease profiles. Retrospective analyses of genotype, allele frequency, and gene expression profiles were conducted on rural populations from malaria-endemic areas, but the comparison to urban controls appears to be implied rather than directly performed. The insights presented emphasize the role of environmental interactions and natural selection in shaping gene expression and health outcomes. However, the study has significant gaps in its analysis and study design, which limit the strength of its conclusions.

One key limitation is the lack of a directly studied urban cohort, which is critical given that the hypothesis centers on the rural-urban divide. The authors speculate that infectious diseases such as malaria and helminth infections, prevalent in rural communities, have been replaced by chronic and non-communicable diseases in urban environments. However, they do not provide references to support this claim. Including more background and evidence for this speculation would strengthen the paper's foundation.

Additionally, the genotype and phenotype data were analyzed exclusively from two rural village populations belonging to the Hausa and Massalit ethnic groups. To substantiate their hypothesis about rural-urban differences, the study must incorporate a direct comparison between rural and urban cohorts. Without this, the conclusions drawn are speculative and lack the robust evidence necessary for broader generalizations.

While the study highlights important concepts regarding natural selection and environmental adaptation, the absence of a complete study design—including a properly matched urban cohort—

reduces its impact. Future studies addressing these limitations could provide more definitive insights into the genetic and immunological consequences of the rural-urban divide in Sudan.

Declarations

Potential competing interests: No potential competing interests to declare.