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REVIEWER'S REPORT

Manuscript No.: **IJAR-52499** Date: 27-06-2025

Title: Hydrochemical characterization of groundwater in the Continental Terminal aquifer of Moundou and its surroundings (southwestern Chad).

Recommendation:
Accept as it is .....
Accept after minor revision.....
Accept after major revision .....
Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality			✓	
Clarity		✓		
Significance			✓	

Reviewer Name: Dr Aamina

Reviewer's Comment for Publication.

General Assessment:
This manuscript presents a thorough and regionally significant investigation into the hydrochemical and bacteriological quality of groundwater in the Moundou area of southwestern Chad. The study is timely and relevant given the increasing demand for potable water in semi-arid and urbanizing environments. The use of a combined approach—integrating physico-chemical and microbiological assessments—adds substantial depth to the evaluation of water quality and supports comprehensive groundwater management strategies.

Abstract Evaluation:
The abstract succinctly outlines the study's objectives, methodology, and key findings. It clearly presents the dual analytical focus: (1) hydrochemical assessment, revealing moderately acidic conditions and mineralization patterns influenced by natural and anthropogenic factors, and (2) bacteriological analysis, which raises concerns about contamination and public health. The use of the GWQI (Ground Water Quality Index) provides a standardized interpretive framework, and the distinction between chemical acceptability and microbial risk is clearly articulated. The abstract is well-balanced and reflects the study's findings accurately.

Introduction Evaluation:
The introduction provides strong contextual grounding, citing global and regional perspectives on water availability, quality, and its role in public health. References to WHO, UNICEF, and other scholarly works underscore the centrality of safe water to human development. The connection between water quality parameters and health risks is well-drawn, and the background justifies the importance of investigating the Moundou aquifer. The cited literature supports the scientific narrative without overwhelming it.

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Methodology:
The methodological framework is clear and appropriately designed. The sample size (60 total, split between chemical and microbiological analysis) is sufficient for regional analysis. The time-based sampling (December 2023 and March 2024) enhances the representativeness of seasonal variation. The parameters chosen—pH, mineral content (e.g., iron, zinc), and key microbial indicators—are well aligned with standard water quality evaluation protocols.

Results and Interpretation:
The results are effectively summarized and scientifically meaningful. The identification of dominant hydrochemical facies—calcium-magnesium bicarbonate and chloride-sulfate—offers valuable insight into the geological and hydrological processes influencing water chemistry. The observation that mineralization is both natural and anthropogenic reflects a nuanced understanding of local environmental pressures. The GWQI categorization from excellent to good suggests that while the chemical properties may be within acceptable limits, the presence of bacteriological contamination represents a significant risk. The conclusion drawn from bacteriological data—that treatment is necessary prior to consumption—is logical and public-health-oriented.

Scientific and Practical Relevance:
This study is of significant practical relevance, especially for water resource managers, urban planners, and public health authorities in Chad and similar contexts. It draws attention to the duality of water quality—chemical acceptability may mask microbial hazards—and reinforces the need for integrated water quality monitoring. The identification of water sources requiring disinfection highlights an actionable outcome of the research.

Language and Structure:
The manuscript is clearly written, with precise scientific language and logical organization. Terminology is consistent and appropriate for a multidisciplinary audience that may include hydrologists, environmental scientists, and public health officials. References are properly cited, and the flow from problem statement to results is smooth and coherent.

Overall Verdict:
This is a well-structured and scientifically valuable study on the hydrochemical and bacteriological quality of groundwater in Moundou. It bridges important domains—geochemistry, environmental health, and water policy—and provides data-driven evidence to inform both academic understanding and local action. The paper effectively meets its objective and contributes meaningfully to regional hydrogeological literature.