

# **Background Research**

I searched for research papers using keywords that matched my variable like ‘Total Dissolved Solids (TDS)’ and ‘water potability’. I mainly used Google Scholar PubMed and ScienceDirect. I looked for studies that explain how TDS is related to water quality contamination and overall drinkability. after that I checked if any papers used datasets like ours or talked about TDS as an indicator for water safety.

- TDS is among the commonest indicators in water quality monitoring. González et al. (2021) showed that high levels of TDS are usually related to more dangerous ions such as nitrates and chlorides, which kind of explains why TDS is important as a marker of pollution. Their findings say that TDS might help in deciding whether the water is good enough for drinking.
- The Water Potability dataset is also quite popular for research in the data science world. Elshewey et al. 2025 utilized ensemble machine learning models to classify water potability and estimated TDS as one of the most important features to predict safe water. This can already suggest there might be some sort of relation between TDS levels and water safety. Similarly, Rachid et al. 2025 used a number of algorithms for finding the best prediction and learned that TDS along with chloramines and sulfate helped improve model accuracy.
- WHO guidelines also emphasize TDS, citing that above a value of approximately 1000 mg/L, the water may not be suitable due to taste odour or possible contamination. All these studies give support to check if the TDS alone has meaningful differences between drinkable and non-drinkable samples.

# **Why the RQ is of interest?**

While previous research has used TDS as just one small part inside big multi-feature prediction models, not many studies actually checked if TDS alone shows a clear statistical difference between drinkable and non-drinkable water. Understanding this relation is important because TDS is simple, cheap, and used a lot in field testing. If TDS really differs strongly between the two groups, then it could be a quick indicator for checking water safety. But if there's no real difference, it kinda shows that we need more than one variable to judge water quality properly. Therefore, this research question helps us to see if TDS has any stand-alone value in diagnosing water safety.