Qeios

Peer Review

Review of: "Long-Term Environmental and Human Health Impacts of Hazardous Waste Incineration: A Case Study in Catalonia, Spain"

Nomathemba Themba[1]

1. Independent researcher

Reviewer's report

Long-Term Environmental and Human Health Impacts of Hazardous Waste Incineration: A Case Study in Catalonia, Spain

Introduction

This is a well-crafted and informative introduction that successfully establishes the rationale and significance of the study.

Methodology

- The section is too brief and lacks essential information on the methods used in the original studies: Sampling techniques (e.g., random, stratified, distance from HWI), Sample types and matrices (soil, vegetation, human tissue, etc.), Analytical methods (e.g., HRGC/HRMS, ICP-MS), Quality control measures, detection limits, or standard protocols followed (e.g., EPA methods), Statistical analysis approaches (trend analysis, risk assessment models, etc.). Without this, readers cannot assess the robustness or reproducibility of the findings.

- No Mention of Study Design Type. It is not clear whether the studies were observational, experimental, cross-sectional, or cohort in nature. Were control groups or reference populations used? Were confounding factors considered?

- Insufficient Justification for Review Approach. The methodology would benefit from briefly stating why a narrative review format was chosen and what inclusion/exclusion criteria were used when

doi.org/10.32388/XA8VW6

selecting which studies or years of data to synthesize.

- Potential Bias Not Addressed. Given that the same research group conducted most of the studies included in the review, this section should acknowledge and account for any methodological harmonization or limitations arising from single-group oversight.

Results

3.1 Historical Context and Baseline Assessment of PCDD/Fs

- No Mention of Detection Limits or Uncertainties. Reporting on detection limits, standard deviations, or confidence intervals would enhance the reliability and interpretation of the baseline values.

- Absence of Figures or Tables (if applicable). The inclusion of summary tables, PCA plots, or maps would enhance the presentation and assist readers in visualizing spatial and temporal patterns.

3.2 Environmental Monitoring Trends After HWI Operations

- The numbering in Section 3.2 is inconsistent and needs correction for clarity and structural coherence.

3. Plasma PCDD/F Levels

- The downward trend in plasma levels is one of the manuscript's strongest results. The use of PBPK modeling to correlate dietary intake and internal burden is highly commendable and should be emphasized further. It would be useful to mention whether national or international tolerable intake levels (e.g., WHO) were ever exceeded.

3. Breast Milk Results

- This section provides compelling evidence that urban dietary patterns (rather than industrial emissions) likely drive maternal PCDD/F burdens. The results support the safety of breastfeeding in the area and should be interpreted with public health messaging in mind. Consider clarifying the potential risks to infants and whether levels ever exceeded thresholds of concern.

3.3 Dietary Exposure Assessment and Trends

- Inconsistent Reporting of Units and Metrics. The switch between "pg I-TEQ/day" and "pg WHO-TEQ/day" without explanation could confuse readers. It's important to clarify why different toxic equivalency factors (I-TEQ vs. WHO-TEQ) are used and when the transition occurred.

- Sudden Spike in 2010 Intake. The slight increase in 2010 (from 27.8 to 33.1 pg WHO-TEQ/day) is mentioned but not sufficiently discussed. Was it due to environmental, methodological, or food

consumption pattern changes?

- No Visual Summary. A figure or chart (e.g., a line graph of dietary intake vs. year, with major food contributors annotated) would greatly improve data communication.

3.4 Health Risk Assessment and Public Health Implications

- Lack of Discussion on Risk Assessment Methodology. There is no description of how risks were calculated (e.g., exposure scenarios, Monte Carlo simulations, reference doses). A few lines outlining key assumptions used in the cited risk assessments would add credibility.

- Limited Discussion on Vulnerable Populations. While children are mentioned in passing, the discussion would benefit from more attention to vulnerable subpopulations (e.g., infants, pregnant women), especially given the breast milk data and known sensitivity to PCDD/Fs.

- Table 1 is highly valuable but overwhelming and very dense. It might benefit from splitting into two tables (e.g., environmental matrices and human biomarkers) or summarizing only key trends. Some units are not harmonized, and typographic errors are present (e.g., "I□TEQ" and "I-TEQ" appear inconsistently due to encoding artifacts). Consider organizing Table 1 chronologically by matrix, using clear subheadings.

Summary of Studies on Metals

- Inconsistent Data Reporting and Lack of Units. Units are sometimes inconsistent (e.g., μg/dL, μg/g, μg/kg, or unspecified) and should be standardized and clearly defined in a footnote or legend.

- No Statistical Analysis Discussion. The section describes increases or decreases in metal concentrations without consistently indicating whether these differences are statistically significant or within natural variability or simply directional trends.

- Hair and Autopsy Tissue Sections Could Be Strengthened. These matrices are critical for chronic exposure assessment, but interpretation is brief. For instance, the section on autopsy tissues would benefit from a comparative context (e.g., how the observed levels compare with national/international norms).

- Unclear Attribution of Changes to HWI vs. Background Sources. In some cases, increased metal concentrations (e.g., As, Cr, V) are reported, but source attribution is vague. Was industrial development, traffic, agriculture, or another factor considered as a potential confounder?

- Improve Table 2 readability. Break the table into two parts for easier digestion: Table 2A: Environmental Matrices (soil, herbage, food). Table 2B: Human Biomonitoring (blood, hair, tissues). Highlight values that exceeded health thresholds (e.g., color code or asterisks).

Reviews and Additional Assessments

- Lack of Detailed Synthesis: The section is descriptive rather than analytical. It simply restates what each review found without integrating or comparing them in depth. It's not made explicit whether any of the reviews raise conflicting interpretations or dissenting views—this would be valuable to discuss. A comparative matrix or summary chart showing findings across reviews would aid reader comprehension.

Limitations

- Insufficient Critical Reflection on Surveillance Gaps: The section could go further by outlining what specific pollutants or methodologies were omitted and how this might bias findings.

Conclusions and recommendations

- Consider adding a call for international collaboration and harmonized standards in HWI risk surveillance.

References

- Over 70% of the references are authored by the same core group (Domingo, Schuhmacher, Nadal, etc.). While this reflects their expertise, it risks citation bias and may affect the perceived objectivity of the findings. Nearly all empirical references are based in Catalonia or broader Spain. While appropriate for a case study, citing comparative data from other EU HWI facilities or even outside Europe (e.g., Japan, Canada, US) would help benchmark findings.

Declarations

Potential competing interests: No potential competing interests to declare.