

Supplementary 1

Table S1. Search strategy based on PECO framework.

PECO	Main Parameters	Synonym/ Truncation (*)
Population	Vulnerable populations	Children: Child* OR Infant* OR Pediatric* OR Adolescent* OR Neonate* OR Newborn* OR Toddler* Maternal and Breasfeeding: Pregnan* OR Gestation OR Prenatal OR Antenatal OR Maternal OR "Expectant Mother" OR Lactat* OR Breastfeed* OR "Nursing Mother" Geriatric: Aged OR Elderly OR "Older Adult*" OR Geriatric*
Exposure	Pyrethroid exposure	Pyrethroid* OR pyrethrin* OR dimefluthrin OR transfluthrin OR imiprothrin OR prallethrin OR deltamethrin OR cypermethrin OR permethrin OR allethrin OR cyhalothrin OR fenvalerate OR esfenvalerate
Comparison	-	No Comparison
Outcome	Organ-specific toxic effect	Integumentary (skin): Skin OR Derma* OR Epiderm* OR Cutaneous Skeletal : Bone OR Osteo* OR Skelet* OR Anthro* Muscle Muscle OR Myo OR Muscular Nervous: Neuro* OR Neura* OR Cognitive OR Nervous System OR Brain OR CNS OR Central Nervous System Endocrine: Endocrine OR Hormone* OR Thyroid OR Estrogen OR Androgen OR Insulin OR Cortisol OR Pituitary Cardiovascular: Cardio* OR Vascular* OR Heart OR Myocard* OR Circulatory System OR Arrhythmia OR Hypertension Hematologic/ lymphatic/ immune: Hematologic* OR Blood Cell* OR Lymph* OR Immune* OR Immuno* OR Leukocyte* OR Cytokine* OR Immunotoxic* Pespiratory: Respirat* OR Pulmonary OR Lung* OR Bronch* OR Asthma OR Airway* OR Alveol* Digestive: Gastrointestinal OR GI Tract OR Digestive System OR Intestin* OR Stomach OR Gut OR Gastro* OR Bladder Renal: Renal OR Neph* OR Kidney* OR Urinary Tract OR Glomerul* OR Nephrotox*

Supplementary 2
Table S2 a. Risk of bias assessment of cross-sectional study.

Study	Risk of bias domains								Score (%)	Bias Category	
	D1	D2	D3	D4	D5	D6	D7	D8			
Yen, <i>et al</i> ; 2024	0	0	0	0	0	0	0	0	0	0	Low
Rodriguez, <i>et al</i> ; 2023	1	0	0	0	0	0	0	0	0	12.05	Low
Freire, <i>et al</i> ; 2021	0	0	0	0	0	0	0	0	0	0	Low
Kim, <i>et al</i> ; 2021	1	0	0	0	0	0	0	0	0	12.05	Low
Hu, <i>et al</i> ; 2020	1	0	0	0	0	0	0	0	0	12.05	Low
Xu, <i>et al</i> ; 2020	1	0	0	0	0	0	0	0	0	12.05	Low
Kunno, <i>et al</i> ; 2019	0	0	0	0	0	0	0	0	0	0	Low
Kim, <i>et al</i> ; 2019	0	0	0	0	0	0	0	0	0	0	Low
Ye, <i>et al</i> ; 2016	0	0	0	0	0	0	0	0	0	0	Low
Van Wendel De Joode, <i>et al</i> ; 2016	0	0	0	0	0	0	0	0	0	0	Low
Ye, <i>et al</i> ; 2017	0	0	0	0	0	0	0	0	0	0	Low
Ye, <i>et al</i> ; 2016	1	0	0	0	0	0	0	0	0	12.05	Low
Wang, <i>et al</i> ; 2016	0	0	0	0	0	0	0	0	0	0	Low

Cross-sectional study risk of bias domain: Eligibility criteria (D1); Subject & setting (D2); exposure measurement (D3); outcome measured validity (D4); presences of confounders(D5); control of confounding factors (D6); outcome measurement (D7); statistical analysis (D8).

Supplementary 2

Table S2 b. Risk of bias assessment of cohort study.

Study	Risk of bias domains											Score (%)	Bias Category	
	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11			
Li, et al.;2025	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Normann, et al.;2025	1	1	0	0	0	0	0	0	0	1	0	0	27.02.00	Moderate
Niantu Nkinsa, et al.;2023	1	1	0	0	0	0	0	0	1	1	0	0	36.03.00	Moderate
Wang, et al.;2023	1	1	0	0	0	0	0	0	0	1	0	0	27.02.00	Moderate
Bomman, et al.;2022	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Corrales Vargas, et al.;2022	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Qi, et al.; 2022	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Shuqi, et al.; 2022	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Chevrier, et al.;2019	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Eskenzi, et al.; 2018	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Fluegge, et al.;2016	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low
Viel, et al.; 2015	1	1	0	0	0	0	0	0	0	0	0	0	18.01	Low

Cohort study risk of bias domain: Group comparability (D1); Exposure measurement consistency (D2); Exposure validity (D3); Confounder (D4); Control of confounding (D5); Baseline free of outcome (D6); Outcome validity (D7); Follow-up duration & adequate (D8); Reporting follow-up (D9); Handling incomplete follow-up (D10); Statistical analysis (D11).