**Fig 2. Study Characteristics & Findings**

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| **Author** | **Region** | **Study Design** | **Study Duration** | **Study Subject** | **Age in Years** | **Sample** | **Exposure Assessment** | **Cancer Type** | **Findings** |
| Salamanca-Fernandez et al. (2021) 1 NO, HR not OR | Spain, EPIC | Case-Cohort | 1992-2013  (16.9 years follow up) | Females;  547 Cases;  1918 subcohort  Males;  575 Cases  1772 subcohort | 29 - 69 | Blood | Free & Conjugated BPA  DLLME and UHPLC-MS/MS | Breast Cancer  Prostate Cancer | They grouped people into three categories based on their BPA levels.  40% higher risk of prostate cancer in the group with the lowest BPA levels compared to those with undetectable levels.  The middle and highest BPA groups also had increased risks of 37% and 31%, respectively, though these were not statistically significant.  There was no significant link between BPA levels and the risk of breast cancer. |
| Wu et al. (2021) 2, OK | Hawaii & California | Nested Case-Control | 1993-2014  (1993-1996 enrollment period)  (13 years follow up) | 2062 Females;  1032 Cases  1030 Controls | 45 - 75 | (2001-2006)  Blood  Urine | LC/HRAM-MS | Breast Cancer | Odds ratio  (T2) of BPA exposure: 0.84 (95% CI: 0.67–1.06) indicating a 16% reduction in risk.  (T3) of BPA exposure: 0.95 (95% CI: 0.75–1.21), signifying a 5% reduction in risk  The P-value for the trend was 0.53, indicating that there was no significant trend of increasing or decreasing risk with higher levels of BPA exposure.  BPA level <=0.84, 0.84-<=1.76, .1.76 ng/g creatinine  E unE  Case 313. 372  Control. 344. 350  E unE  Case 347 372  Control. 336. 350 |
| Morgan et al. (2017) 3, OK table 16 | US  NHANES | Cross-Sectional | NHANES data 1999-2004 | 2007 Female  Participants | 20 - 85 | Urine | LC-MS | Breast Cancer | No significant associations was found between BPA and breast cancer risk  Use adjusted OR a or adjusted OR b? table 16. Model b Adjusted for age and race/ethnicity. A adjusted for age and race/ethnicity.  OR 0.76 (0.45 - 1.30) |
| Keshavarz-Maleki et al. (2021) 4  Need more clarification on OR | Iran (Tehran) | Case-Control | July 2018 to December 2019 | 52 Females;  41 cases;  Mastectomy patients  11 control;  Reduction mammoplasty patients. | 34 - 72 | Urine  Breast Adipose tissue | ELISA kit (Detroit R&D) | Breast Cancer | BPA levels in cases  92.68% - urine  73.17% - adipose tissue  BPA levels in controls  81.82% - urine  73.17% - adipose tissue  BPA levels in urine and tissue were significantly higher in the breast cancer (case) group than in the control group.  The presence of BPA in breast adipose tissue might increase the risk of breast cancer incidence  Table 5. select model III tissue  and IV urine.  effects of age and BMI were adjusted. |
| Hiroi et al. (2004) NO 6 | Japan | Cross-Sectional | NA | 37 Females;  10 - SEH  9 - CEH  11- Endometrial cancer  11 Controls | 40-56  for SHE, CEH & Controls  58-68 for cancer | Blood | ELISA | Endometrial Cancer | BPA in the blood were lower in patients with complex endometrial hyperplasia and endometrial cancer when compared to normal women and those with simple endometrial hyperplasia. |
| Tarapore et al. (2014)  5 NO | US  (Cincinnati) | Cross-Sectional | NA | 60 Males;  27 Cases  33 Controls | Case;  56-87  Control;  46-77 | Urine | HPLC coupled with ESI-MS/MS | Early-Onset Prostate Cancer | BPA levels in PCa patients were approximately 300% higher (5.74 / 1.43 = 4) than those in non-PCa patients.  In the group of patients under 65 years of age, PCa patients had BPA levels approximately 800% higher (8.08 / 0.90 = 8.9) than non-PCa  These findings suggest a significant association between higher BPA levels and the presence of prostate cancer. |
| Aquino et al. (2019)  7 NO | Italy | Pilot Case- Control | December 2016 to May 2017 | 24 Females;  17 Cases  7 Controls | 50 - 69 | Urine  Blood  Uterine tissue | Free & Conjugated BPA  GC-MS/MS | Endometrial Cancer | Total BPA was 39% higher in the blood and urine of women with endometrial cancer (cases) compared to women with benign uterine conditions (controls).  Total BPA in uterine tissue were 69% lower in cases compared to controls. |
| Hong et al.  (2022) 8 ok | China | Case Control | July 2017 to October 2019 | 122 Males;  50 Cases  72 Controls  95 Females;  37 Cases  58 Controls | Case;  49 - 72  Control;  48 - 73 | Urine | LC-MS/MS | Colorectal Cancer | * BPA detection rate in CRC patients: 88.5% * Median urinary BPA concentration in CRC patients: 1.92 µg/g * BPA detection rate in healthy controls: 93.8% * Median urinary BPA concentration in healthy controls: 1.65 µg/g   They divided CRC patients into high and low BPA exposure groups based on a cut-off value of 4.21 μg/g.  In the high exposure group, participants were more likely to have:   * Larger tumor sizes. * Higher degrees of pathological infiltration stage. * Longer transfer distances. * Higher differentiation grades (all with P < 0.05).   A significant positive association between BPA exposure and the risk of colorectal cancer, particularly in individuals with higher BPA exposure levels.  Adjust OR 4.45 (95% CI, 1.31 – 15.14) Figure. 1 Adjusted by age, gender, BMI, smoking and drinking. |
| Tse et al. (2017) 9 | China  (Hong Kong) | Case-Control | August 2011 and November 2016 | 833 Males;  431 Cases  402 Controls | 35–84 | Self-reported use of food & beverage container  New BPA assessmentool with ICC 0.94 | Cumulative BPA Exposure Index  (CBPAI) | Prostate Cancer | Only 7 (1.6%) cases and 1 (0.2%) control had incomplete information on BPA.  There was a positive exposure-response relationship between CBPAI and prostate cancer,  Table 3  Low vs middle  OR = 1.54, 95% CI 1.05 – 2.26  Low vs high  OR = 1.57, 95% CI 1.01 – 2.44 |
| Loperz-Carrillo et al. (2021) 10 OK | Northern Mexico | Case-Control | 2007 to 2011 | 798 Females;  394 Cases  404 Controls | Median age of 52 years | Urine | Biologically active form of BPA (BPA-F)  HPLC/FLD | Breast Cancer | The levels of BPA-F (a form of BPA in urine) were significantly higher in cases compared to controls (3.16 μg/L in cases and 2.47 μg/L in controls)  Breast cancer was significantly associated with BPA-F levels, particularly among women with the highest BPA-F exposure compared to those with the lowest.  Table 4 (μg/L)  BPA level OR  ≤1.39 ref  1.40–12.05 0.73 (0.39–1.35)  >12.05. 2.31 (95% CI: 1.43–3.74)  B Adjusted for age (years) and creatinine (mg/dL)  Limit of Detection (LOD)=2.78 μg/L |
| Trabert et al. (2014)  11 ok | Poland | Case-Control | January 2000 - January 2003 | 1150 Females;  575 Cases  575 Controls | 20–74  (mean = 59) | Urine | Unconjugated BPA & BPA-G  HPLC/MS/  MS | Breast Cancer | There was no indication that increased BPA-G was associated with post-menopausal breast cancer (p-trend = 0.59)  OR 1.04 95% CI 0.91 – 1.17  Conditional logistic regression models, conditioned on age and study site and adjusted for education, body mass index, age at menarche, parity, years since menopause, duration of menopausal hormone therapy use, family history of breast cancer, history of benign breast disease, and ever had a screening mammogram. |
| Ajayi et al. (2014) 12 NO | Nigeria | Case-Control | NA | 80 Females;  40 Cases  40 Controls | Cases; 47.90 ± 1.83  Control; 51.10 ± 2.32 | Blood | Solid-phase extraction with HPLC | Breast Cancer | BPA levels were significantly higher in breast cancer patients, indicating it might play a role in breast cancer development. (p<0.05) |
| Ishtiaq et al. (2023) 13 NO | Pakistan  (Rawalpindi,) | Cohort | NA | 45 breast cancer patients | NA | Breast Tissue  Blood | HPLC–UV | Breast Cancer | Use of canned food;  4.7% Yes  95.2% No  Use of plastic bottles;  71.4% Yes  28.5% No  The level of BPA in the serum samples of breast cancer patients was significantly higher than control |
| Zhang et al. (2023) 14 OK | China | Case-Control | June 2017 to September 2017 | 172 Females;  86 Cases  86 Controls  50 Males;  25 Cases  25 Controls | 42.5 ±  11.2 | Urine  Blood | UPLC-MS/MS | Papillary Thyroid Cancer | BPA had the highest average concentration, followed by BPF and BPS.  Higher levels of BPF were associated with an increased risk of PTC (odds ratio of 1.80), while higher levels of BPA and BPS were associated with a decreased risk of PTC (odds ratios of 0.38 and 0.63, respectively).  Table 2 Model 3: Multivariable logistic regression analyses, BPA, BPS, BPF entered the same model and adjusting for age, gender, BMI, smoking habits,  serum TG, and urinary concentrations of iodine, thiocyanate, perchlorate, mono-n-butyl phthalate (MBP), monoethyl phthalate (MEP), di(2-ethylhexyl) phthalate  (DEHP) metabolites.  OR = 0.38 [0.19, 0.77] |
| Marotta et al. (2023) 15 OK | Italy | Cross-Sectional | May 2017 to May 2019 | 96 participants;  41 Cases;  55 Controls;  (30 Males,  66 Female) | Median age 51  (19–77) | Blood | HPLC | Thyroid Cancer | Subjects with benign nodules as control group  In the overall study population and in the group with BMI<25 kg/m2 BPA exposure was not significantly correlated to thyroid cancer (p = 0.08)  In the group with BMI≥25 kg/m2, BPA-exposed subjects showed significantly higher risk of malignancy (= 0.028).  BPA exposure is a risk factor for thyroid cancer in overweight/obese subjects**.**  Table 3  OR = 2.86 95% CI 0.85 – 9.55 |
| Deng et al.(2021)  16  Ok | China  (Wuhan) | Case- Control | November 2016 to October 2019 | Females;  105 Cases;  179 Controls;  Males;  170 Cases;  358 Controls; | Cases 59.22 ± 11.22,  Controls 58.80 ± 8.08 | Urine | UHPLC with MS | Colorectal Cancer | BPA was detected in nearly all samples among cases and controls, indicating people had widespread exposure to BPA.  The observed urinary concentration of BPA in cases was significantly higher compared with controls.  BPA is associated with Colorectal Cancer risk  Table 2 OR = 1.58 95% CI 1.4 – 1.79  after adjusting for sex, age, and smoking status.  Figure 1. the mediating effect of HNE-MA |
| Zhou et al. (2017)  17 needs consideration | China | Case- Control | February 2013 to September 2013 | 113 Cases;  53 PTC  60 NG (Nodular Goiter)  65 Controls’  (Females 128  Males 50) | NA | Blood  Urine | Total (free & conjugated) BPA  HPLC–MS/MS | Papillary Thyroid Cancer (PTC) | There were no differences in serum total BPA concentration among the NG, PTC, and the healthy control groups  Urinary BPA concentrations (UBC) were higher in the NG and PTC groups compared with the control group  High UBC, but not serum total BPA concentrations (TBC), are likely to be associated with NG and PTC  **PTC**  Higher urinary BPA\*  (>2.84 ng/ml) \*  Unadjusted urinary concentration.  Table 4  Adjusted OR 3.57 1.37–9.30 |
| Yang et al. (2009) 18 NO. not provided OR | South Korea | Case- Control | 1994 - 1997 | 152 Females;  70 Cases;  82 Controls; | Case;  46.23 ± 10.39  Control;  48.56 ± 11.69 | Blood | Free & conjugated BPA  Reverse phase-HPLC/FD & LC/MS/MS | Breast Cancer | In age-matched subjects (*N* = 152), there were some associations between BPA levels and risks of breast cancer, such as age at first birth and null parity.  However, there were no significant differences in blood BPA levels between the cases and the controls (*P* = 0.42).  This suggests that the Korean population may have slightly lower exposure to BPA compared to some other regions. |
| Bao et al. (2020) 19 NO, HR is used not OR | US, NHANES | Cohort | 2003–2015  Person-years of follow-up  (Median, 9.6 years;  Maximum, 13.1 years) | 3883 participants  (both sexes) | >20 | Urine | Solid-phase extraction & HPLC with MS/MS | All Cancer Types | During 36 514 person-years of follow-up 75 deaths occurred from cancer.  After adjustment for age, sex, race/ethnicity, and urinary creatinine levels, participants higher urinary BPA levels had a 51% higher risk of all-cause mortality  There was no statistically significant association between BPA exposure and cancer mortality. (HR, 0.98; 95% CI, 0.40-2.39) |
| Morgan et al. (2016) 20 OK | US, NHANES | Cross- Sectional | 2005 - 2010 | 2202 Females;  (15 cervical, 16 ovarian, & 22 uterine cancer cases) | 20 - 85 | Urine | Solid-phase extraction & HPLC with MS/MS | Cervical,  Ovarian, & Uterine Cancers | BPA levels were elevated in women with ovarian cancer when compared to those without gynecologic cancer.  However, when the analysis was adjusted for various factors such as age, race, BMI, and age at menarche, statistically significant associations was not found between urinary BPA and gynecologic cancers.  Table 13 OR2 cervical cancer 1.33 (0.42, 4.18);  Ovarian cancer 1.41 (0.3, 6.7)  Uterine cancer 0.57 (0.25, 1.29)  Level of detection (LOD) to 50th percentile (reference) vs.  ≥ 50th percentile.  2Adjusted for age, race/ethnicity, BMI, age at  menarche; Noncases=1821. |
| Morgan et al. (2017) | US, NHANES | Cross- Sectional | 2005 - 2010 | 2145 Females | 20 - 85 | Urine | Solid-phase extraction & HPLC with MS/MS | Breast Cancer | BPA significantly higher in women without cancer vs. women with breast cancer, p < 0.05.  The statistical analysis showed that there was no significant association between BPA levels and breast cancer risk.  The statistical analysis did not show a significant link between BPA exposure and breast cancer, even after adjusting for factors like age, race, BMI, and age at menarche. |
| Ahrens et al. (2007)  22 OK | Denmark, France, Germany, Italy, Spain, Sweden | Case- Control | 1995 - 1997 | 183 Cases;  1938 Controls;  For BPA  Exposed;  9 Cases  87 Controls  Unexposed; 114 Cases 1784 Controls | 32 - 72 | Self-reported job  Descriptions | Cumulative Exposure Index (CEI)  (Semi quantitative variables;  1. Probability  2. Intensity  3. Duration of exposure) | Biliary Tract Cancer | In this study, the risk of extra hepatic biliary tract cancer was increased among the participants ever exposed to endocrine-disrupting compounds with a known estrogenic effect (alkyl phenols, PCB, bisphenol A).  Table 4 ORC 2.1 (1.0, 4.3)  Adjusted for age, country and gallstones.  Based on this data, there is evidence to suggest a link between BPA exposure and an increased risk of cancer. The fact that the lower limit of the CI is 1 (and not below 1) reinforces the idea that there is a probable increased risk, rather than a chance finding. |
| Marotta et al. (2019) 23 OK . definition of BPA exposure ? | Italy | Cross- Sectional | 2017 | 55 participants;  28 - DTC  27 - benign nodules  (Both sexes) | 15–77 | Blood | HPLC/FD/  UV | Differentiated Thyroid Cancer (DTC) | A significant correlation between human exposure and the risk of DTC was found for 2 BPs (BPE and BPAF) (OR 14.44, 95% CI 11.69–122.98, p= 0.005)  A significant relationship was found between malignancy and the detection in the serum of both bisphenol AF  Table 3 univeriate analysis OR 3.71 95% CI (0.67 – 20.34) |
| Qu et al. (2022) 24 ok  Do not know the define of BPA level of exposure | China | Case- Control | January 2020 –  May 2021. | 226 Cases;  243 Controls;  (269 Males, 200 Females) | 31 - 78 | Urine | BPA, BPS & BPF  UPLC-MS/MS | Lung Cancer | BPA and BPS concentrations were higher in the case group, while BPF concentrations were similar in both groups.  In the stratification analysis, the significant correlation between urinary creatinine-corrected concentrations of BPA and the risk of lung cancer still observed in male participants (OR = 1.36, 95% CI: 1.09, 1.62, *p* = 0.040).  This study demonstrates that elevated human exposure to BPA and BPS may be associated with the increased lung cancer risk.  Table 3 adjusted OR 1.28 (1.17, 1.40) Creatinine-corrected  BPA  Models adjusted by gender, age, education level, BMI, household income,  smoking habit, and drinking habit. |
| Chen et al. (2022) 25 OK needs considerations of ORs – the BPA exposure  The LOD is 0.01 to 0.08 ng/ml | China | Case- Control | March - December 2016 | 143 Cases;  224 Controls;  (264 Females, 103 Males) | NA | Urine | BPA, BPS, BPF  UPLC coupled to quadrupole mass spectrometry (MS/MS) | Thyroid Caner | Among the measured phenols, BPS had the highest detection rate, followed by BPA, and BPF had higher detection rate in the control group than that in the cancer group,  It was found that elevated urinary bisphenol A (BPA) and bisphenol S (BPS) levels were associated with increased risk of thyroid cancer (all *P* for trends < 0.05)  Table 3. BPA μg/L. adjusted model  < LOD compared with 0.04 – 1.84 group OR = 2.09 95% CI 1.15 – 3.77  < LOD compared with 1.84 – 26.03 group OR = 2.06 95% CI 1.06 – 3.97  The model was adjusted for urinary creatinine, gender, age, BMI, alcohol use, smoking status and income. |
| li et al. (2020) 26  OK needs to decide  which BPA levels | China | Case- Control | 2016 - 2018 | 615 Cases;  615 Controls;  (Both sexes) | Cases;  59.2 mean  Control;  58 mean | Urine | Total BPA  UHPLC/MS | Non-Small Cell Lung Cancer (NSCLC) | NSCLC cases had higher urinary BPA levels when compared to the healthy controls.  The positive associations between BPA concentrations and NSCLC were significant in both males (*P* = 0.001 for the highest quartile) and females (*P* = 0.021 for the highest quartile).  Exposure to high levels of BPA was significantly associated with NSCLC (adjusted OR = 1.91, 95%CI: 1.39–2.62, *P* < 0.001 for the highest quartile).  Table 2 adjusted model. (μg/g creatinine)  BPA level. OR  <= 039. ref  0.4-0.73 0.83  0.74-1.32. 0.8  >1.32 1.91 |
| Parada et al. (2019 27 OK. Needs to consider BPA level | US | Case- Control | 1996 – 2014 | 711 Cases  598 Controls | 22 - 96 | Urine | Solid-phase extraction with HPLC & MS/MS | Breast Cancer | BPA levels were elevated in some women with breast cancer, but the statistical significance of this finding was not very strong.  Further research may be needed to better understand the relationship between BPA exposure and breast cancer.  BPA (μg/g creatinine)  Table 3 BPA. OR  <LOD-0.95 1  0.958-1.38 0.76  1.38-2.04 0.76  2.05-3.63 0.8  3.63-388 0.75  for age (continuous in years), education (<HS/HS graduate, College, and Post-college), menopausal status (pre- vs post-menopausal),  hormone replacement therapy use (never vs ever), age at menarche (≤12 vs >12 years of age), parity/lactation history (Nulliparous, Parous/never  lactated, Parous/ever lactated), family history of breast cancer (None vs First degree), body mass index (<25.0, 25.0-29.9, and ≥30.0 kg/m2), and  lifetime alcohol intake (non-drinkers, <15, 15-29, ≥30 grams per day). |
| Jia et al. (2013) 28 ok consider BPA level | China | Case- Control | 2009–2011 | 106 Cases; 112 Controls;  Both sexes | 16.13 ± 2.80 Cases  15.89 ± 2.13 Controls | Urine | HPLC-MS | Osteosarcoma | The study suggested that -22G/C polymorphism in LOX gene may have modified the relationship between BPA exposure and osteosarcoma risk.  High BPA exposure was associated with an increased risk of osteosarcoma overall  Table 2  Compared with subjects in low  exposure rank, those with BPA level more than 7.01 ng/ml  had an increased risk of osteosarcoma overall (OR =1.41;  95% CI, 1.01-1.72). |
| Shivam et al. (2022) 29 NO | India | Case- Control | NA | 45 Cases  45Controls | 18 - 75 | Blood | Structural changes in blood components by BPAQ using UV visible Spectrophotometry | Breast Cancer | The serum samples from breast cancer patients had increased mean absorbance at a range of 250 nm to 300 nm and 360 nm to 450 nm as compared to control samples  The results revealed that there is an association between active metabolite of Bisphenol-A and MDM2 SNP309 G variant with the risk of breast cancer in Indian population. |
| Komarowska et al. (2022) 30 No | Poland | Pilot Study | NA | 53 participants  24 - low grade meningioma  29 – glioma  (27 Females, 26 Males) | 20 - 71 | Plasma | Free & Conjugated BPA  GC-MS | Meningioma & Glioma | The concentrations of BPA in patients were compared to those obtained in wide-ranging studies published in the literature.  Free and conjugated BPA were present in both meningioma and glioma patients. Moreover, their concentrations far exceeded those reported in the healthy population.  Occurrence of both meningioma and glioma may be accompanied by increased concentrations of leptin and BPA.  Further large-scale studies are needed to clarify whether the presence of both substances may play a role in pathogenesis or influence clinical course in patients with brain neoplasms. |
| **Duan et al. (2013) 31 OK consider BPA levels** | China | Case- Control | 2009-2010 | 45 Cases  45Controls | 53.5 Cases  54.7 Controls | Urine | Total BPA  Solid-phase extraction coupled with HPLC–MS | Meningioma | Increasing urine BPA levels are positively associated with meningioma (*P* < 001, OR = 1.4, 95 % CI = 1.1 ≤ OR ≤ 1.8).  The association between BPA and meningioma did not differ by BMI status.  Table 2  BPA level ng/ml. OR  < 0.53 ref  0.54-0.91 1.4  0.92-1.69 1.45  >1.69 1.57  Adjusted for gender, age (years), race, BMI (normal body weight,  overweight, and obesity), HRT use (no or yes), family history of  cancer (no or yes), using unconditional logistic regression |

Notes: BPA = Bisphenol A; BPA-G = BPA-Glucuronide; CBPAI = Cumulative BPA Exposure Index; ELISA = Enzyme-Linked Immunoassay; FD = Fluorescence Detector; GC = Gas Chromatography; HPLC = High-Performance Liquid Chromatography; LC = Liquid Chromatography; MS = Mass Spectrometry; MS/MS = Tandem Mass Spectrometry; NA = Not Available; NHANES = National Health and Nutrition Examination Survey; UHPLC = Ultra-High-Performance Liquid Chromatography; UPLC = Ultra-Performance Liquid Chromatography; US = United States; UV = Ultraviolet.