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The balance of evidence on 100% juice & health: A systematic umbrella review of meta-analyses

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Fruit and vegetable intakes are major modifiable determinants of risk for non-communicable disease[(1)], yet intake levels remain low[(2)] and multiple barriers (cost, access, perishability, preparation skills) exist[(3,4)]. 100% fruit and vegetable juices contain key micronutrients and bioactive compounds [(5–7)] and may help circumvent these barriers to consumption[(6,7)]. However, their role in dietary guidelines and models of healthy eating remains controversial due to their free sugars and reduced dietary fibre content, relative to whole fruits and vegetables[(6,7)]. Therefore, we conducted a systematic umbrella review of systematic literature reviews (SLRs) with meta-analyses assessing the relationships between 100% juice consumption and human health outcomes. Four databases (Medline, Cochrane Library, EMBASE, and CINAHL) were systematically searched for SLRs with meta-analyses of human prospective cohort, case-control, and intervention studies examining the relationship between 100% juice and any health outcome through to 20th October 2022. Screening (Covidence), quality (GRADE)[(8)], risk of bias (ROBIS)[(9)] and content overlap (corrected covered area[(10)]) tools were applied, and extracted data were narratively synthesised. The protocol was pre-registered (PROSPERO) and conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklists. 15 SLRs on 100% fruit juice including 51 primary meta-analyses, 6 dose-response analyses, and 87 sub-analyses were eligible for inclusion. No eligible studies on vegetable juice were found. Included studies represented data from almost 2 million subjects with a range of doses (50-1200mL/day) and timeframes (hours to years). Significant improvements in health outcomes were found in 19.6% of included meta-analyses (blood pressure, flow-mediated dilation, IL-6, c-reactive protein, and stroke mortality), and increased disease risks were found in 5.9% of included meta-analyses (CVD mortality, prostate cancer, and type II diabetes). The remainder (74.5%) found no significant difference (blood lipids, weight, liver function, metabolic markers, colorectal and breast cancers, and multiple inflammatory markers). The ROBIS quality assessment rated nine SLRs as low risk of bias, three as unclear and three as high. Using GRADE, confidence in the body of evidence ranged from very low (27 primary and 79 secondary meta-analyses) to low (19 primary and 13 secondary meta-analyses), and medium (4 primary and one secondary meta-analyses.) Findings show 100% juice consumption has limited risks of harm and some potential benefits, over a broad range of doses, including some that are relatively high, and time periods. The positive associations between 100% juice consumption and specific health outcomes relevant to population health may be explained by multiple mechanisms, including the vitamin, mineral, and bioactive contents. The balance of evidence suggests that 100% may have a neutral or beneficial place in general, population-level dietary guidelines.

Keywords: Juice; dietary guidelines; chronic disease; nutritional epidemiology

Ethics Declaration

Yes

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