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Hospital Meals as a Major Cause of Food Waste and Associated Carbon Footprint: Evidence from a Prospective Study in a Greek Public Hospital

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Abstract

Food waste in healthcare is increasingly recognised as both a nutritional and environmental challenge, contributing to greenhouse gas emissions and resource spoilage. The present study aimed to evaluate the environmental impact of a public hospital food service system by quantifying the carbon footprint associated with ingredients used in patients' menus and food waste generated throughout meal preparation and distribution process. Daily quantification of prepared food, unserved meals, and plate waste was conducted daily over 184 meals (89 lunches, 95 dinners). The carbon footprint of the key menu ingredients was estimated by using emission factors from international climate databases. Data normality was confirmed via Shapiro-Wilk tests. Non-parametric Mann-Whitney U test was used to assess statistically significant differences between meals, while Kruskal-Wallis test evaluated differences between different clinics. Carbon footprints of key ingredients (beef, pork, chicken, perch, potatoes, pasta, dairy) were calculated using emission factors from the Big Climate Database (Denmark). Overall waste averaged 48.8% of prepared food (30.85% unserved meals; 17.8% plate waste). While more patients were served at lunch time ($p = 0.008$), dinner had a larger overall waste ($U = 2265.50$, $Z = -5.43$, $p < 0.001$) and a significantly higher amount of unserved food ($U = 2334.00$, $Z = -5.25$, $p < 0.001$) than lunch. Both the amount of prepared food ($p = 0.001$) and the total waste per patient ($p < 0.001$) were significantly higher in dinner. No statistically significant variation in plate waste was observed between lunch and dinner ($p = 0.079$). Among 4703 dishes analysed, beef generated the highest emissions (126.3 kg CO2eq), while chicken emissions were ~4-fold lower despite 82.7% greater quantity used. No significant inter-clinic differences emerged ($p > 0.05$). These findings indicate that hospital meal systems substantially increase food waste and greenhouse gas emissions. Aligning menus and portion sizes with patients' medical needs and preferences can minimize plate waste, enhance nutritional intake, and promote sustainable use of resources in clinical nutrition practice.

Keywords: Food waste, plate waste, loss waste, climate crisis, carbon footprint

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