

Validation of a food frequency questionnaire specific for salt intake in Saudi Arabian adults using urinary biomarker and repeated multiple pass 24-hour dietary recall

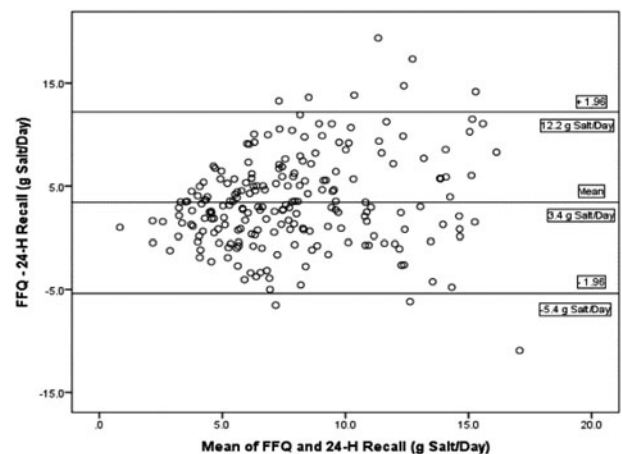
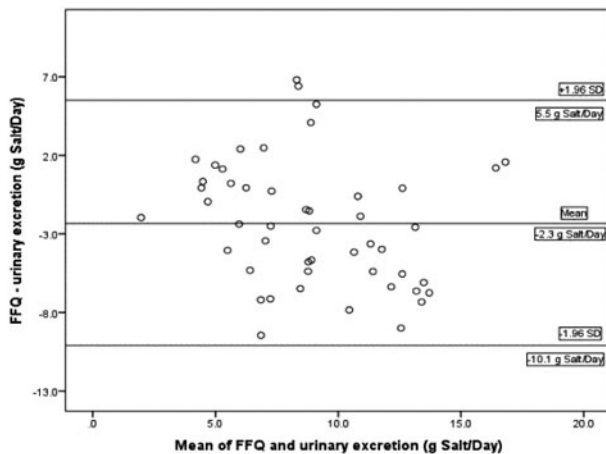
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Socioeconomic status and lifestyle (including dietary habits) have dramatically changed in Saudi Arabia (SA) over the last few decades. SA suffers from a high burden of non-communicable diseases (NCDs) such as cardiovascular diseases and hypertension. There is no data on habitual salt intake in SA apart from one study in the Eastern region 8.1 g/day, not representative for the general population. Food frequency questionnaires (FFQ) are practical for epidemiological studies, but need to be developed and validated for specific populations because foods are culture-dependent⁽¹⁾. To our knowledge, there is no validated Saudi specific FFQ, apart from one semi-quantitative FFQ for the assessment of vitamin A intake only⁽²⁾. We aimed to develop a culture-specific FFQ and evaluate its validity in estimating the intake of salt in Saudi Arabian population.

A quantitative FFQ was developed using a food list of common foods and composite dishes consumed by Saudi adults from previously collected 24-hour dietary recall⁽³⁾. The FFQ was pretested and finalized with 133 food items. A specific question was included regarding table salt use. The FFQ was validated against repeated multiple pass 24-Hour dietary recalls (MP24-HR) and urinary biomarkers for a sub-sample of the population. Participants (aged 19–60) were recruited from the community in Riyadh City, Kingdom of Saudi Arabia in 2013. Informed consent was collected and blood pressure and anthropometrics measurements taken. Participants received verbal and written instructions on how to collect the urine samples for 24 hours. The mean daily intake of salt (NaCl), were estimated from measured urinary sodium (Na) using WHO equation (1 g of NaCl = 393.4 mg of Na).

A total of 601 participants were recruited (265 males, 336 females, median age 29, IQR 24–38). All completed the FFQ and repeated MP24-HR. A sub-sample of 71 subjects (24 males, 47 females, median age 38, IQR 25–45) provided urine samples, 49 of which (18 males, 31 females) provided complete 24-h urine collections (creatinine index falling inside the range of 11–20 and 14–26 mg/kg body weight/day for women and men respectively). The median urinary sodium output was 3457 mg/24 h (IQR 2298–4696), equivalent to 8.7 g salt/24 h (IQR 5.8–11.9), higher than the recommended level of <5 g/d for salt⁽⁴⁾. Around 60 % of the population always adding salt while cooking and 73 % never add it while eating. The correlation between FFQ and food recall was weak ($r_s = 0.376$, $p < 0.001$), and moderate for FFQ and urinary excretion ($r_s = 0.502$, $p < 0.001$). The biases between FFQ and food recall, and FFQ and urinary excretion were relatively small (3.4 and 2.3 g salt/day, respectively, Fig.1&2), although with wide limits of agreement (–5.4 and 12.2 g salt/day, and –10.1 and 5.5 g salt/day, respectively). Therefore, we can conclude that the newly developed FFQ deemed a valid and practical tool to assess sodium and salt intake in the Saudi adult population.



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