



# Effect of different cooking methods on the content of total vitamin C, ascorbic acid and dehydroascorbic acid of the galega kale

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To cite this article: Carolina Vieira, Marta da Silva, Margarida Simões, Gonçalo Rodrigues, Tânia Albuquerque, Renata Ramalho & Paula Pereira (2021) Effect of different cooking methods on the content of total vitamin C, ascorbic acid and dehydroascorbic acid of the galega kale, *Annals of Medicine*, 53:sup1, S105-S106, DOI: [10.1080/07853890.2021.1896080](https://doi.org/10.1080/07853890.2021.1896080)

To link to this article: <https://doi.org/10.1080/07853890.2021.1896080>



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Published online: 28 Sep 2021.



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**Discussion and conclusions:** Our results meet those of recent studies that enhance the importance of UG in feeding populations, especially those with diminished food security and low access to fresh quality products [6–8]. Increased level of activity, higher fruit and vegetable consumption, along with savings in the family budget were referred by gardeners supporting the need for a more in-depth study. The UG is eligible for an observational study using the methods already stated. In addition, collection of anthropometric data and nutritional and cognitive screening tests would allow for a better view of the gardeners health.

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## Acknowledgements

The authors acknowledge no conflict of interest.

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DOI: 10.1080/07853890.2021.1896077

## Effect of different cooking methods on the content of total vitamin C, ascorbic acid and dehydroascorbic acid of the galega kale

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### ABSTRACT

**Introduction:** Adequate daily intake of vitamin C is essential to maintain numerous physiological processes in the human body. Humans cannot produce endogenous vitamin C and therefore are dependent on dietary intake [1]. Galega kale is grown and consumed across the world and is a rich source of antioxidants such as vitamin C [2]. However, little is known about how domestic cooking methods affect the nutritional composition and bioavailability of nutrients in fresh vegetables. The aim of this study was to investigate the effect of four different domestic cooking methods (boiling, braising, sautéing and a typical Portuguese soup, caldo-verde) on the content of total vitamin C, ascorbic acid and dehydroascorbic acid of the galega kale.

**Materials and methods:** Samples of galega kale were obtained from the University Garden of Instituto Universitário Egas Moniz. Samples were washed and the inedible parts were discarded. The final samples consisted of 16 g of kale with a ratio of leaves to stems of 75/25. Samples were submitted to four domestic cooking methods: boiling, sautéing, braising and a traditional Portuguese soup, caldo-verde and raw Galega Kale was used as a control. Determination of total vitamin C, acid ascorbic (AA) and acid dehydroascorbic (DHA) was done using high-performance liquid chromatography (HPLC) according to the method described by Valente et al. [3].

**Results:** The caldo-verde soup led to the greatest reduction in total vitamin C content (−77%), followed by boiling (−63%), sautéing (−48%) and braising (−29%). AA content decreased by 65%, 38% and 22% for caldo-verde, boiling and sautéing, respectively, whereas, braising increased AA by 16%. Sautéing and braising showed comparable effects on DHA content (−71% and −72%, respectively), while caldo-verde and boiling had a greater impact (−88% and −85%, respectively).

**Discussion and conclusions:** Results of this study show that cooking techniques can negatively affect the vitamin C content of galega kale. The extent of this reduction was dependent on the cooking technique, temperature and duration used. The greatest reductions in total vitamin C, AA and DHA were seen when water was used as a source of heat (i.e. boiling and caldo-verde). The longer boiling period (~75 min) used for the caldo-verde soup likely led to the greater reduction in vitamin C when compared to boiling (10 min). These effects are consistent with observations done by others [2,4]. Our findings suggest that sautéing and braising are the two cooking techniques that have the least detrimental effect on vitamin C content in galega kale.

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## Acknowledgements

The remaining authors would like to profoundly thank Dr. Tânia Albuquerque for her contribution and support throughout this study.

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DOI: 10.1080/07853890.2021.1896080

## Food intake assessment and anthropometric characterisation of teenage gymnasts

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### ABSTRACT

**Introduction:** Food and nutrition have a critical role in health, sports performance but also in a proper growth a development when we consider young athletes [1,2]. In addition to the increased energy needs, there is a special concern in ensuring adequate intakes of specific micronutrients such as calcium and iron [3]. The aim of the present study was to evaluate the food intake of a group of teenager gymnasts and to compare energy, macronutrient and micronutrient intake with recommendations for this age group.

**Methods:** In this observational study, the teenager gymnasts had answered two 24 h dietary recall applied three days apart. The sample included 66 participants 11–17 (14.74±1.79) years old and 26 (39%) were male. Participants were weighted in a 100 g digital scale (Beurer GS-10) and had their height measured in a stadiometer (SECA213). Body fat had been assessed through skinfold measurement using a INNOVACARE Cescorf through Durnin & Womersley formula which included 5-site measures (bicep, tricep, subscapula, suprailiac and abdominal).

**Results:** Results had shown that 15% were overweight and only 3% were obese, 39% of the sample had normal values of body fat. The average energy intake was 1660±621 kcal while the calcium average intake was 652±307 mg, significantly lower than the recommended value ( $p=.02$ ). The average Iron intake in female athletes was 7.68±2.81 mg, also significantly lower than the recommended ( $p=.03$ ). In this sample 23 participants (35%) of the young athletes did not had any dairy portion and 47 (72%) did not had any portion of vegetables daily.