

RESEARCH ARTICLE

Open Access



Impact of lunch provision on anthropometry, hemoglobin, and micronutrient status of female Cambodian garment workers: exploratory randomized controlled trial

Jan Makurat^{1*} , Natalie Becker¹, Frank T. Wieringa², Chhoun Chamnan³ and Michael B. Krawinkel¹

Abstract

Background: Lunch provision is expected to improve the nutritional status of Cambodian garment workers. The objective of this study is to evaluate the effects of a model lunch provision through a canteen on anthropometry, hemoglobin, and micronutrient status in female garment workers in Cambodia.

Methods: This exploratory randomized controlled trial was implemented at a garment factory in Phnom Penh, Cambodia. Female workers (nulliparous, non-pregnant) were recruited and randomly allocated into an intervention arm (workday's lunch provision) and a control arm. Served lunch sets (~ 700 kcal on average) included diverse local dishes. Anthropometry (body mass index, weight, triceps skinfold thickness, and mid-upper arm muscle circumference), as well as hemoglobin, serum ferritin and soluble transferrin receptor, serum retinol binding protein, and serum folate concentrations were assessed at baseline and after 5 months of lunch provision. A general linear model with adjustments for baseline values was used to estimate intervention effects for each outcome variable.

Results: Two hundred twenty-three women were recruited ($n = 112$ control and $n = 111$ intervention). 172 ($n = 86$ in each arm) completed the study. Baseline prevalence of underweight, anemia, depleted iron stores, and marginal iron stores, were 31, 24, 21, and 50%, respectively. Subjects were not affected by frank vitamin A or folate deficiency, whereas 30% showed a marginal folate status. Overall, mean changes in anthropometric variables, hemoglobin, and retinol binding protein were marginal and not significant among intervention subjects. Mean folate concentration increased insignificantly by + 1.1 ng/mL (- 0.02, 2.2) ($p = 0.054$). On the other hand, mean ferritin decreased by - 6.6 $\mu\text{g/L}$ (- 11.9, - 1.3) ($p = 0.015$). Subgroup analysis prompts that effects are differently pronounced according to the baseline status of workers.

Conclusions: Findings indicate that model lunch sets provided a beneficial amount of dietary folate, but need to be revisited for iron content and/or iron bioavailability. It is believed that distinct positive effects on anthropometry, hemoglobin, and micronutrient status can solely be expected in malnourished individuals. The authors suggest that similar larger trials, which include sets adapted to the concrete needs of workers affected by underweight, anemia and/or definite micronutrient deficiencies, should be performed.

(Continued on next page)

* Correspondence: jan.makurat@ernaehrung.uni-giessen.de

¹Institute of Nutritional Sciences, Justus Liebig University Giessen, Wilhelmstrasse 20, 35392 Giessen, Germany

Full list of author information is available at the end of the article



© The Author(s). 2019 **Open Access** This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The Creative Commons Public Domain Dedication waiver (<http://creativecommons.org/publicdomain/zero/1.0/>) applies to the data made available in this article, unless otherwise stated.