以加鈣米介入學童營養午餐爲增加學童鈣質攝取量良好方式之探討

Using Calcium fortified rice in lunch program increases calcium intake in school children

中文摘要

本研究爲評估學童在鈣質攝取不足情況下，藉由主食米飯營養強化鈣質方式爲增加飲食鈣之攝取量良好方式。針對市售營養強化鈣質食品包含市售加鈣點心與市售加鈣米及市售鈣錠劑共三種不同類別增加鈣質攝取之方式，以市售佔有率配合文獻回顧生物利用率方式分析內容物鈣化合物型式並配合成本利益、成本最小值及可近性分析，結果顯示鈣含量較種類爲重要，又以市售加鈣米一碗 80 克得 304 毫克鈣量且爲必需之正餐熱量來源爲理想營養強化鈣食品。進一步評估加鈣米是否經過清洗和烹煮的過程有鈣流失情形及口感接受度，故取得目前市售兩種廠牌 S 加鈣米及 C 加鈣米，委託食品工業研究所以感應耦合電漿原子發射光譜儀 (Inductirely coupled plasma atomic emission spectrometer, ICPAES) 進行鈣定量分析分析，得到加鈣米經過清洗和烹煮的過程中能保留 98.36% ~ 93.71%的鈣含量，顯示輕微洗米過程中不會有太多鈣質流失；由台北醫學大學保健營養學系師生共 33 人，平均年齡 24.7 ± 1.2 歲進行 S 加鈣米及 C 加鈣米官能品評試驗，得 S 加鈣米較 C 加鈣米、白米在外觀、香味、口味、黏性、總評部份皆有較佳之接受度，以 S 加鈣米進行介入試驗。

由台北市 37 所具中央廚房國民小學中以隨機抽樣方式挑選螢橋國小四年級及五年級各一班進行營養午餐介入。使用飲食頻率問卷和 3 天飲食日記、輔以 24 小時回憶法進行飲食評估結果受試男童、女童鈣質攝取占 10~12 歲國人膳食營養素參考攝取量 (Dietary reference intakes, DRI’s) 41%~45%，乳品攝取部份每日平均攝取爲 0.64 份，顯示受試學童確實有鈣攝取不足之情形。加鈣米介入期間，定量學童米飯進食量，結果 S 加鈣米和一般供應的米食並沒有顯著差異。每碗 S 加鈣米可獲鈣量占 10~12 歲 DRI’s 30.4%，分別占受試男、女童現況鈣攝取量的 68%、74%，以加鈣米進食後，飲食鈣低於 DRI’s 1000 毫克男童由 96% 降低至 77.2%、女童由 92%降低至 87.5% ，考量在最高鈣攝取量的學童增加 608 毫克的鈣，結果皆未超過鈣質上限攝取標準 2500 毫克。分別以五年級、四年級營養午餐實際進食日數 117 日、81 日除以一年 365 天計算，加鈣米平均單日平均花費 1.25 元、0.87 元，單日提供熱量 90 大卡、63 大卡，爲正餐熱量攝取。除進食量之外，進一步於加鈣米推廣因素分析學童對加鈣米攝取利益、障礙及重要他人支持部分顯示學童對攝取加鈣米意圖正向，且在家人、老師支持下以學童營養午餐介入可近性高。綜合結論藉由加鈣米介入學校營養午餐可有效且便利增加學童鈣質攝取量。

英文摘要

The purpose of this study is used to assess the fortified of calcium through food (mainly rice) to increase the calcium intake of school children. Literature reviews were used to identify the optimal method of forming calcium chemical by investigating the cost-benefit analysis (CAB), cost effectiveness analysis (CEA), cost-minization analysis (CMA) and accessibility analysis of commercial calcium supplement, calcium fortified snacks, calcium fortified rice from market products. In this study, we obtained 304mg of calcium quantity per 0.91NT of 80 grams for calcium fortified rice since there was no additional source of calories was the optimal food to fortified with calcium. Using the commercial sold S brand and C brand calcium fortified rice to evaluate the calcium reserve during the cooking process by Inductively Coupled Plasma Atomic Emission Spectrometer (ICPAES) at the Institute of Food Industry, found out that in the process of cleaning and cooking, calcium fortified rice was able to retain 98.36% ~ 93.71% of calcium, indicating a low calcium loss. A total of 33 students and faculty members from school of Public Health, Taipei Medical University with an average age of 24.7 ± 1.2 gave an sensory evaluation of S calcium fortified rice, C calcium fortified rice and milled rice including the appearance, smell, taste, viscosity, and overall evaluation. S calcium fortified rice have better acceptable so we choose that to intervene in school luch program to increase dietary calcium intake.

Out of 37 kitchen equipped elementary schools, ying-giao elementary schools one calss for fifth graders and fourth graders respectively was randomly selected to have its school lunch intervened. Using food questionnaires and 3 day dietary records supported by 24-hour recall. for food evaluation, the average calorie intake was found to be 1920 ± 59 kcal for boys and 1921 ± 84 for girls. The Calcium intake was 41%~45% of the Dietary Refernece Intakes (DRI's) and the daily dairy intake was 0.64 portions for 10-12 year olds During the period of intervention, no significant difference between milled rice and brand S rice; the calcium obtained from each bowl of brand S rice was 30.4% of the DRI's . There was 68% and 74% form boys and girls for daily calcium intake individually. After using calcium fortified rice as the main meal, the percentage of calcium intake less than 1000mg dropped from 96% to 77.2% for boys and 92% to 87.5% for girls, without exceeding the limit of 2500mg. Using the actual consumption days of the school lunch for fifth graders (177 days) and fourth graders (81 days), the daily average calorie provided by calcium fortified rice was 90 kcal per 1.25NT and 63 kcal per 0.87 NT without the increase in calorie intake, there is no concern for weight gain. The calcium fortified rice in school lunch was successful probably due to the support of parents and teachers. In conclusion, using calcium fortified rich in school lunch in elementary schools is a very effective and convenient way to increase calcium intake.