Exercise and QUality diet After Leukemia (The EQUAL Study): An intervention trial in the Childhood Cancer Survivor Study (CCSS)

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Background: Adult survivors of childhood acute lymphoblastic leukemia (ALL) are at risk for obesity and cardiometabolic disease. Exposure to cranial radiotherapy (CRT) increases these risks. We tested whether a weight loss intervention that was successful in the general population could result in weight loss or improvements in metabolic parameters for overweight or obese ALL survivors.

Methods: Obese and overweight ALL survivors from the CCSS, stratified by history of CRT, were randomized to receive a 24-month remotely delivered diet and physical activity intervention or self-directed weight loss (control). Participants were 5-year survivors of ALL diagnosed < age 21. The intervention emphasized a reduced calorie DASH diet and physical activity via an app, a web site, and calls with a health coach (up to weekly). The primary endpoint was the difference in weight loss between the two arms at 24 months after randomization, using an intent-to-treat analysis. Secondary endpoints included differences in the changes in blood pressure, cholesterol, and triglycerides. Analyses were performed using linear mixed effects. The study was designed to detect a difference between arms of 2.75 kg.

Results: Of 358 survivors (59% female, 91% white non-Hispanic race/ethnicity, median age of 37 years, IQR: 33-43), 181 were randomized to the intervention and 177 to the control group. Baseline mean (SD) weight was 98.6 kg (24.0) for intervention group and 94.9 kg (20.3) for controls. Weight after 24 months was available for 274 participants (77%). 55 (30%) of participants adhered to the intervention beyond one year. At 12 months, after controlling for CRT, sex, race/ethnicity, and age, the adjusted mean (SE) change in weight from baseline was -1.83kg (0.7) for intervention and -0.16kg (0.64) for control participants. At 24 months, the adjusted mean (SE) change in weight from baseline was -0.36kg (0.78) for intervention and +0.18kg (0.66) for control participants with the average difference of -0.54 kg (95%CI: -2.5,1.5, p=0.59) between the two arms. A small proportion had at least 5% weight loss at 24 months (intervention 31/128; 24%; control 25/146; 17%). No significant differences in the average change from 24 months to baseline in systolic or diastolic blood pressure, total cholesterol, LDL, HDL, or triglycerides were observed between intervention vs control (**Table1**).

Conclusions: A 24-month phone and app/web-based diet and physical activity intervention that was successful for weight loss in the general population did not result in greater weight loss or improvement in blood pressure or cholesterol levels, when compared to controls, among adult survivors of childhood ALL. Reduced adherence to the intervention beyond 12 months, or lack of ALL survivor-specific tailoring, may account for these findings.

Table 1. Differences in weight loss and metabolic parameters after 24 months in a diet and physical activity intervention, compared to controls, among 358 survivors of acute lymphoblastic leukemia in the Childhood Cancer Survivor Study.

Variable	All participants* N=358 Difference (95%CI)	No CRT** Difference (95%CI)	CRT** Difference (95%CI)
Weight (kg)	-0.54 (-2.5,1.5)	1.88 (-1.45,5.21)	-2.1 (-4.6,0.33)
Systolic Blood Pressure (mmHg)	-0.38 (-3.9,3.2)	-6.0 (-11.2,-0.57)	3.0 (-1.4,7.6)
Diastolic Blood Pressure (mmHg)	-1.3 (-4.1,1.5)	-4.2 (-9.0, 0.56)	0.74 (-2.7,4.2)
Fasting Insulin (mIU/L)	2.5 (-8.3,13.3)	8.5 (-15,32.2)	1.5 (-7.8,11.0)
LDL (mg/dL)	3.8 (-4.1,11.8)	3.5 (-9.8,16.9)	3.7 (-6.3,13.7)
HDL (mg/dL)	0.5 (-3.2,4.3)	2.0 (-2.9,7)	-0.24 (-5.2,4.7)
Triglyceride (mg/dL)	18 (-4.3,41.5)	16 (-19.751,9)	28 (0.3,57)
Total cholesterol (mg/dL)	6.6 (-3.3,16.4)	8.0 (-8.1,24.2)	5.8 (-6.7,18.5)

CRT: Cranial radiotherapy

*Analysis for weight was adjusted for CRT, race, sex, and age; other analyses were adjusted for CRT, race, gender, age and body mass index

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