

RESULTS

Sociodemographic Characteristics of Participants

The mean age of the participants was 59.15 ± 7.16 years. Majority of the participants (85%) were females (**Table 1**) and half of the participants (50%) were married. More than half (60%) of the participants had their highest level of education up to primary. About 50% of the participants were employed. Also, half (50%) of the participants were on two types of anti-hypertensive medications with only a few (10%) on three medications. More than half (59%) of the medication participants were taking at the time of the study were calcium channel blockers.

Table 1. Sociodemographic Characteristics of Participants

Parameter	Frequency (n)	Percent (%)
Gender		
Male	3	15
Female	17	85
Marital Status		
Single	1	5
Married	10	50
Widow	9	45
Level of Education		
Primary	12	60
Secondary	6	30
No Formal Education	2	10
Occupation		
Employed	10	50
Unemployed	6	30
Retired	4	20
Number of Medication		
One	8	40
Two	10	50
Three	2	10
Medication Type		
Calcium Channel Blockers	20	59
Thiazide Diuretics	6	18
ARBs	6	18
ACE Inhibitors	2	6

ARBs-angiotensin receptor blockers and ACE- angiotensin-converting enzyme inhibitors

Most of the anthropometric parameters including body weight, BMI, total fat and visceral fat did not change post-intervention (**Table 2**). A significant reduction in the waist circumference was observed post-intervention.

Table 2. Anthropometry characterisation of participants before and after the intervention

Parameter	Week 0	Week 6	Mean Difference (Week 6 – Week 0)	<i>p</i> -value
Body Weight (kg)	71.6 ± 15.5	71.8 ± 15.5	0.2 ± 0.4	0.619
BMI (kg/m ²)	29.1 ± 6.1	29.0 ± 6.1	-0.1 ± 0.1	0.665
Total Fat (kg)	42.7 ± 9.4	41.8 ± 9.3	-0.9 ± 0.6	0.167
Visceral Fat (kg)	10.4 ± 3.7	10.4 ± 3.3	-0.2 ± 0.2	0.298
Lean Muscle Mass (kg)	22.3 ± 4.1	22.5 ± 4.3	0.3 ± 0.6	0.674
Waist Circumference (cm)	99.2 ± 12.4	95.8 ± 12.0	-3.4 ± 0.4	<0.001

Values for Week 0 and Week 6 are presented as mean ± SD, whereas mean difference is presented as mean ± SEM and *p*-value is obtained from a Paired T-test. Abbreviation: BMI, body mass index.

The study compliance rate of the participants was 95% as almost all participants reported consuming 30 g/d cocoa nibs over a duration of 6 weeks. This also shows that the consumption of the cocoa nibs was generally acceptable to the participants. The cocoa nib intervention significantly lowered SBP and DBP ($p < .01$, both) (**Fig. 2**). Using a repeated measures linear mixed model, mean (SEM) SBP at Week 6 was 5.7 ± 2.2 mmHg lower than Week 0 (post-hoc, $p = .011$), whereas the DBP at Week 6 was similarly 5.2 ± 1.3 mmHg lower than Week 0 (post-hoc, $p = .003$). However, there were no significant change in SBP or DBP from Week 0 to Week 3 (post-hoc, $p > .05$, both). Using a paired T-test, cocoa nibs also significantly improved the lipid profile, marked by a significant decrease in mean total cholesterol (-1.6 ± 0.3 mmol/L, $p < .001$) and LDL cholesterol (-1.7 ± 0.3 mmol/L, $p < .001$) (**Table 3**). Cocoa nibs had no significant effect on triglycerides and HDL cholesterol ($p > .05$, both).

Figure 2. The effects of cocoa nib intervention on (A) SBP and (B) DBP are presented as estimated marginal means \pm SEM following a linear mixed model

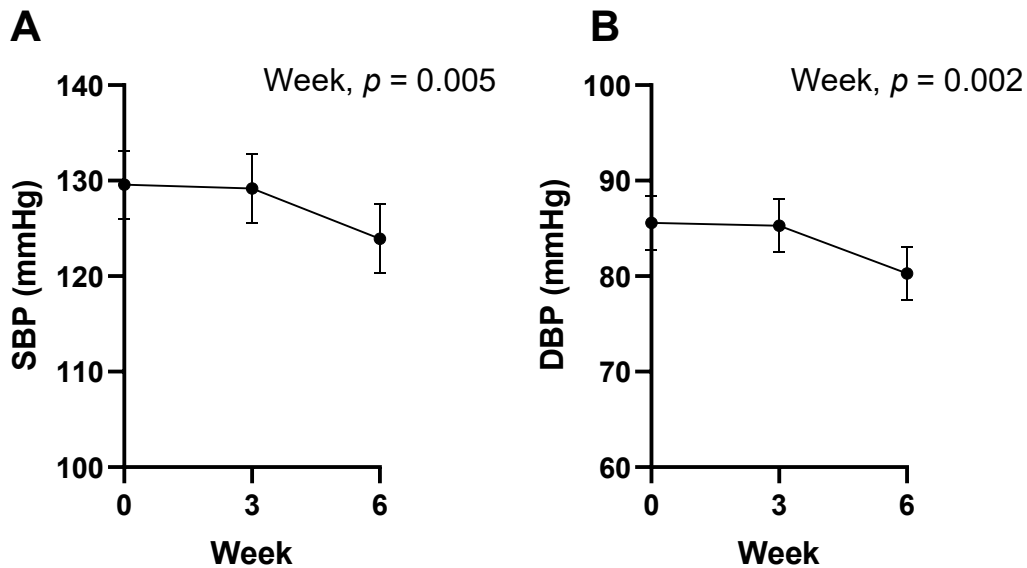


Table 3. Lipid profile of participants before and after the intervention.

Parameter	Week 0	Week 6	Mean Difference <i>p</i> -value (Week 6 – Week 0)
Total Cholesterol (mmol/L)	6.4 \pm 0.5	4.7 \pm 1.0	-1.6 \pm 0.3 <0.001
LDL-C (mmol/L)	4.1 \pm 0.5	2.4 \pm 1.1	-1.7 \pm 0.3 <0.001
HDL-C (mmol/L)	1.6 \pm 0.3	1.7 \pm 0.3	0.1 \pm 0.1 0.178
Triglycerides (mmol/L)	1.6 \pm 0.7	1.3 \pm 0.5	-0.3 \pm 0.2 0.103

Values for Week 0 and Week 6 are presented as mean \pm SD, whereas mean difference is presented as mean \pm SEM and *p*-value is obtained from a Paired T-test. Abbreviations: LDL-C, low density lipoprotein cholesterol; HDL-C, high density lipoprotein cholesterol

The Laxation Effect of Cocoa Nibs on the Participants

Table 4 below, cocoa nibs had a significant effect on the number of times participants empty their bowels in a week ($p < 0.001$). The mean difference on bowel emptying between the baseline and endpoint is -3.05, 95% CI [-4.01, -2.10].

Analysis from figure 3 below, shows a 19.50% increase on ease of defecation at endpoint from baseline (70%). At the end of the intervention, no individual (0%) recorded a feeling of incomplete defecation as compared to the baseline recording of 20%. At baseline, a little over half (55%) of the participants had soft and/or runny stools, this percentage increased to 68.40% after the intervention. The above indicates a positive laxation effect when cocoa nibs are consumed.

Table 4 Paired sample t-test on frequency of bowel emptying of participants

	N	Mean	Mean Difference	95% Confidence Interval of the Difference	P-value
Bowel Emptying (per week)					
Baseline	19	7.74	-3.05	-2.10 - -4.01	< 0.001
Final	19	10.79			

N = Sample size

Figure 3. Bowel health assessment of participant

