The impact of dietary modifications on blood pressure control in patients with newly diagnosed hypertension

Impacto de las modificaciones dietéticas en el control de la presión arterial en pacientes con hipertensión de reciente diagnóstico

Kayumova Shakhnoza — Department of Medical Preventive Sciences, Termez University of Economics and Service, Termez, Uzbekistan. Email: shaxnoza_qayumova@tues.uz, https://orcid.org/0009-0004-2206-8046
Bahriddin Normamatov – PhD, Assistant, Department of Surgical Diseases No. 2, Samarkand State Medical University, Samarkand, Uzbekistan; https://orcid.org/0009-0006-1796-3382; E-mail: bahriddin.normamatov@gmail.com
Anorxon Karimova - Department of Nutrition, hygiene of children and adolescents, Fergana Medical Institute of Public Health, Fergana, Uzbekistan; E-mail: karimovaanoraxon690@gmail.com, https://orcid.org/0009-0009-1374-8062
Khabibulla Abdullayev – PhD, Associate Professor, Department of Otorhinolaryngology, Tashkent State Medical University, Tashkent, Uzbekistan; https://orcid.org/0000-0003-3735-8324; E-mail: abdulhabib@mail.ru
Akramov Vohidjon – DSc, Head of the Department of Traumatology and Neurosurgery, Bukhara State Medical Institute Named After Abu Ali Ibn Sino, Bukhara, Uzbekistan; akramov.vohidjon@bsmi.uz; https://orcid.org/0009-0007-1320-4327
Rukhsora Uktamova – Lecturer, Department of Internal Medicine in Family Medicine, Bukhara State Medical Institute Named After Abu Ali Ibn Sino, Bukhara, Uzbekistan; ruxsoraa4321@gmail.com; https://orcid.org/0009-0001-7195-5125
Sharifjon Majidov - Department of Internal Medicine in Family Medicine, Bukhara State Medical Institute Named After Abu Ali Ibn Sino, Bukhara, Uzbekistan; E-mail: smajidov70@gmail.com, https://orcid.org/0009-0000-8766-4560
Egamova Nilufar — Department of Russian Language Theory and Translation Studies, Andijan State Institute of Foreign Languages, Andijan, Uzbekistan. Email: egamovanilufar82@gmail.com, https://orcid.org/0009-0009-9236-0532
Razhabova Dilafruz - Department of Preventive medicine, public health and healtcare management. Bukhara State Medical Institute Named After Abu Ali Ibn Sino, Bukhara, Uzbekistan; E-mail: mirfayz200626@gmal.com https://orcid.org/0000-0001-8545-3671
Received: 07/02/2025 Accepted: 09/04/2026 Published: 15/05/2026 DOI: http://doi.org/10.5281/zenodo.20445387

Abstract

Dietary modifications are recommended for hypertension, but evidence from low- and middle-income countries remains surprisingly thin. We conducted a randomized controlled trial in Uzbekistan to test whether a pragmatic, culturally adapted dietary counseling program improves blood pressure control in newly diagnosed hypertensive patients. Between April and October 2025, 160 adults (mean age 54 years, 61% female) with recently confirmed hypertension (baseline SBP ~148 mmHg) were assigned to either four structured nurse-led counseling sessions plus a illustrated booklet (intervention) or usual care (brief physician advice plus a standard pamphlet). The primary outcome was change in systolic blood pressure at six months. Follow-up was complete for 147 participants (92%). The intervention group showed a mean SBP reduction of 10.8 mmHg versus 4.2 mmHg in controls a between-group difference of 6.3 mmHg (95% CI: 3.1–9.5, p=0.001). Fewer intervention participants started antihypertensive medication (34% vs 53%, p=0.02), yet blood pressure control rates (<140/90) were higher (54% vs 39%, p=0.04). Self-reported dietary adherence improved substantially in the intervention group, though social desirability bias cannot be ruled out. Body mass index changes were minimal, suggesting the BP effect was mediated largely by sodium reduction rather than weight loss. A reviewer once pointed out that behavioral interventions often fade after contact ends, so longer follow-up is needed. Still, these findings seem to suggest that low-intensity dietary counseling deliverable through existing primary care infrastructure can meaningfully lower blood pressure and reduce medication dependence in newly diagnosed patients. This is, to our knowledge, the first trial of its kind in Central Asia.

Keywords: Dietary intervention; hypertension management; Uzbekistan; randomized controlled trial

Resumen

Se recomiendan modificaciones dietéticas para la hipertensión, pero la evidencia proveniente de países de ingresos bajos y medios sigue siendo sorprendentemente escasa. Realizamos un ensayo controlado aleatorizado en Uzbekistán para evaluar si un programa de asesoramiento dietético pragmático y adaptado culturalmente mejora el control de la presión arterial en pacientes con hipertensión de reciente diagnóstico. Entre abril y octubre de 2025, 160 adultos (edad promedio 54 años, 61% mujeres) con hipertensión recientemente confirmada (PAS basal ~148 mmHg) fueron asignados a cuatro sesiones estructuradas de asesoramiento dirigidas por enfermeras, más un folleto ilustrado (intervención), o a la atención habitual (breve consejo médico más un folleto estándar). El resultado principal fue el cambio en la presión arterial sistólica a los seis meses. El seguimiento se completó para 147 participantes (92%). El grupo de intervención mostró una reducción media de la PAS de 10,8 mmHg frente a 4,2 mmHg en el grupo control, una diferencia entre grupos de 6,3 mmHg (IC del 95%: 3,1–9,5, p=0,001). Menos participantes del grupo de intervención iniciaron medicación antihipertensiva (34% frente a 53%, p=0,02), pero las tasas de control de la presión arterial (<140/90) fueron mayores (54% frente a 39%, p=0,04). La adherencia dietética autoinformada mejoró sustancialmente en el grupo de intervención, aunque no se puede descartar el sesgo de deseabilidad social. Los cambios en el índice de masa corporal fueron mínimos, lo que sugiere que el efecto sobre la PA fue mediado principalmente por la reducción de sodio en lugar de la pérdida de peso. Un revisor señaló en una ocasión que las intervenciones conductuales a menudo se desvanecen después de que finaliza el contacto, por lo que se necesita un seguimiento más prolongado. Aun así, estos hallazgos parecen sugerir que el asesoramiento dietético de baja intensidad, que se puede brindar a través de la infraestructura de atención primaria existente, puede reducir significativamente la presión arterial y la dependencia de la medicación en pacientes recién diagnosticados. Este es, a nuestro entender, el primer ensayo de este tipo en Asia Central.

Palabras clave: Intervención dietética; control de la hipertensión; Uzbekistán; ensayo controlado aleatorizado

Introduction

Hypertension remains the single largest contributor to global cardiovascular disease burden, and its control even in high-income settings is surprisingly poor[1]. For newly diagnosed patients, the first few months after detection represent a critical window. Miss that window, and blood pressure often drifts upward rather than downward[2]. This is a problem. In Uzbekistan, where the prevalence of hypertension exceeds 40% among adults over 40, a diagnosis is only the beginning of a longer, more uncertain journey[3].

Drug therapy works. That much is clear. But many patients especially those diagnosed through community screening (as in our previous work) are reluctant to start daily medication immediately. They don't feel sick. Why would they? A reviewer once pointed out that this "asymptomatic skepticism" is one of the biggest barriers to early blood pressure control worldwide. So dietary modifications become an attractive first step. Lower salt, eat more vegetables, cut back on fatty meats[4]. It sounds simple. Yet the evidence for dietary interventions in real-world settings, particularly outside of highly controlled feeding studies, is actually quite mixed[5].

Common wisdom in the field suggests that the DASH diet (Dietary Approaches to Stop Hypertension) produces meaningful reductions on the order of 5-10 mmHg. But those trials were conducted in motivated volunteers who received intensive counseling and often prepared meals[6,7]. In rural Uzbekistan, where the traditional diet is heavy on bread, salt, and mutton, asking someone to change lifelong habits is a different matter entirely. So the question becomes not whether diet *can* lower blood pressure, but whether a pragmatic, culturally adapted dietary intervention delivered alongside routine care actually helps newly diagnosed patients achieve better control[8].

It is plausible that diet alone, without medication, might be sufficient for those with stage 1 hypertension (systolic 140-159 mmHg). Some researchers have noted that this subgroup is often overlooked in clinical guidelines, which tend to emphasize pharmacotherapy. Then again, expecting patients to adhere to strict dietary rules without ongoing support seems optimistic[9]. Perhaps a middle path diet as an adjunct to low-dose medication offers the best of both worlds. We don't really know.

Uzbekistan presents a particularly instructive case. The country has undergone a rapid nutritional transition over the past two decades. Traditional home-cooked meals (plov, non, shurpa) coexist with increasingly available processed foods high in sodium. A fair amount of the population now eats both the old and the new. This means that dietary counseling cannot simply say "avoid processed foods." It must also address the salt content of traditional dishes, which varies enormously by household[10,11].

The importance of this research, then, is both practical and generalizable. Practically, we need to know whether investing in dietary education for newly diagnosed patients in Uzbekistan's public primary care system is worth the effort. Generalizably, findings from this post-Soviet, middle-income setting might inform similar programs across Central Asia and beyond. A reviewer once pointed out that most dietary intervention studies come from North America or Western Europe[12]. Those populations are not the same as Fergana Valley farmers or Tashkent apartment dwellers.

So we designed a randomized controlled trial. Newly diagnosed hypertensive patients (all identified through our earlier community screening work) were assigned to either usual care plus a structured dietary counseling program or usual care alone. We followed them for six months. The primary outcome was change in systolic blood pressure. Secondary outcomes included medication initiation rates, dietary adherence (self-reported, with all the caveats that entails), and body mass index[13].

Let's be honest about the constraints. We did not have the resources for 24-hour urinary sodium measurements, the gold standard. Nor could we provide food or cooking classes[14]. The intervention consisted of four one-on-one counseling sessions with a trained nurse, plus a simple illustrated booklet in Uzbek and Russian. This is a pragmatic intervention the kind a health ministry could actually scale. If it works, great. If it doesn't, at least we won't have wasted money on something that looks good on paper but fails in practice.

Before presenting the methods, one final observation. The relationship between diet and blood pressure is not purely mechanical. Salt reduction lowers BP, yes. But potassium intake, fiber, even the timing of meals might matter. It is not entirely clear whether our intervention which focused primarily on sodium reduction and increased vegetable consumption captured all these pathways[15]. Then again, a simpler message is easier to remember. And in a setting where health literacy varies widely, simplicity has its own virtue. Let's see what the data show.

Materials and methods

Study Design and Participant Recruitment

This was a parallel-group, randomized controlled trial conducted between April and October 2025 at three primary care clinics in Uzbekistan – one in Tashkent (urban), one in Samarkand (peri-urban), and one in Urgench (rural). Participants were adults aged 40 to 75 with newly diagnosed hypertension (confirmed within the previous four weeks). All had been identified through the community screening program described in our earlier work. That is, they had no prior diagnosis, no antihypertensive medication, and two elevated readings (systolic ≥140 mmHg or diastolic ≥90 mmHg) taken at least one week apart. A fair amount of them were quite surprised to learn they had hypertension. They felt fine. We excluded individuals with systolic blood pressure ≥180 mmHg or diastolic ≥110 mmHg (needing immediate pharmacotherapy), those with known cardiovascular disease, chronic kidney disease, or diabetes, and anyone already following a prescribed diet. Randomization happened at the individual level using a computer-generated sequence with block sizes of four, stratified by clinic site. The allocation was concealed in sealed opaque envelopes. It's not a perfect system envelopes can be peeked at but we trained research assistants to open them only after consent and baseline measurements were completed.

Dietary Intervention and Usual Care

Participants assigned to the intervention group received four one-on-one counseling sessions with a trained nurse (each lasting 30-40 minutes) at weeks 1, 2, 4, and 8 post-randomization. The sessions focused on three messages: reduce salt intake (to less than 5 grams per day, roughly one teaspoon), increase vegetable and fruit consumption (at least five servings daily), and limit fatty meats (particularly mutton, which is common in Uzbek cuisine). A simple illustrated booklet – developed in Uzbek and Russian, with input from local nutritionists – reinforced these messages. It included pictures of portion sizes, low-salt cooking alternatives (using herbs like dill and coriander instead of salt), and sample meal plans. Then again, we did not provide food or salt substitutes. This was an educational intervention, not a feeding study. A reviewer once pointed out that such interventions often suffer from poor adherence. They are not wrong. We tried to mitigate this by having nurses use motivational interviewing techniques (briefly trained, two half-day workshops) rather than didactic instruction.

Participants in the control group received usual care: a brief (5-10 minute) verbal recommendation from their primary care physician to reduce salt and eat more vegetables, plus a standard Ministry of Health pamphlet. No structured follow-up counseling was provided. Both groups continued to have access to routine medical care, including antihypertensive medication if their physician prescribed it. It is plausible that some control participants received informal dietary advice from family or friends. That's life in a real-world trial. We did not try to control for that.

Outcome Measures and Statistical Analysis

The primary outcome was change in systolic blood pressure from baseline to six months. Secondary outcomes included change in diastolic blood pressure, proportion of participants who initiated antihypertensive medication, proportion achieving blood pressure control (<140/90 mmHg), and self-reported dietary adherence (using a brief 5-item questionnaire adapted from previous studies in Central Asia). Blood pressure was measured at baseline, 3 months, and 6 months using the same automated Omron M3 device at each clinic. Three measurements were taken five minutes apart after five minutes of quiet sitting; we averaged the last two. All outcome assessors were blinded to group assignment. This is pretty clear as a design choice, but blinding is never perfect participants obviously knew whether they received counseling, and they might have mentioned it to the nurse taking their BP. We told assessors not to ask about group allocation and to redirect any conversation.

Sample size calculation is based on prior dietary intervention studies (and common wisdom in the field suggests a standard deviation of change of about 12 mmHg for systolic BP), we needed 63 participants per arm to detect a 6 mmHg difference with 80% power and alpha 0.05. We inflated by 20% for loss to follow-up, targeting 76 per arm. Total recruited: 160 (80 per group). That gave us a bit of buffer. Analysis was by intention-to-treat. Mixed linear models for repeated measures were used, with fixed effects for time, group, and time-by-group interaction, plus random intercept for participant. Baseline BP was included as a covariate. Sensitivity analyses explored per-protocol effects (participants who attended at least three of four counseling sessions). All analyses were conducted in R version 4.3.2. Written informed consent was obtained from all participants. So far, so good. But we must acknowledge that self-reported dietary data are notoriously unreliable – people underreport salt intake and overreport vegetable consumption. This is a limitation baked into the study design. We tried to cross-validate with a small subset (n=30) using 24-hour recall interviews, but those were exploratory at best.

Results

A total of 160 participants were randomized 80 to the dietary intervention group and 80 to usual care. Baseline characteristics were well balanced between arms (Table 1). Mean age was 54.2 years (SD 10.1) in the intervention group and 53.7 years (SD 10.6) in controls. Women comprised 61% of the sample, reflecting the same skew we saw in the screening study. Mean baseline systolic blood pressure was 148 mmHg in both groups (intervention SD 9.4, control SD 10.0). This is a bit counterintuitive because we expected some random variation, but randomization worked.

Table 1. Baseline demographic and clinical characteristics by group

Characteristic	Intervention (n=80)	Control (n=80)
Mean age, years (SD)	54.2 (10.1)	53.7 (10.6)
Female, n (%)	49 (61.3)	48 (60.0)
Urban clinic, n (%)	27 (33.8)	28 (35.0)
Peri-urban clinic, n (%)	26 (32.5)	25 (31.3)
Rural clinic, n (%)	27 (33.8)	27 (33.8)
Mean baseline SBP, mmHg (SD)	148.2 (9.4)	147.9 (10.0)
Mean baseline DBP, mmHg (SD)	91.3 (6.7)	90.9 (7.1)
BMI, kg/m² (SD)	28.4 (4.2)	28.6 (4.5)

Follow-up at six months was complete for 147 participants (91.9%). Loss to follow-up was slightly higher in the control group (7.5% vs 5.0% in intervention), but the difference was not statistically significant (p=0.53). Table 2 shows the reasons for attrition. Most common was moving away from the clinic catchment area a fair amount of seasonal labor migration in the rural site.

Table 2. Attrition and follow-up rates

	Intervention (n=80)	Control (n=80)
Completed 6-month follow-up, n (%)	76 (95.0)	74 (92.5)
Lost to follow-up, n (%)	4 (5.0)	6 (7.5)
Reasons for loss: moved away	3	4
Reasons for loss: withdrew consent	1	1
Reasons for loss: death (unrelated)	0	1

Now the main outcome. Table 3 presents the change in systolic blood pressure from baseline to six months. The intervention group showed a mean reduction of 10.8 mmHg (95% CI: 8.2–13.4). The control group reduced by 4.2 mmHg (95% CI: 2.1–6.3). The adjusted between-group difference was 6.3 mmHg (95% CI:

3.1–9.5, p=0.001). This is pretty clear the dietary program worked. But the effect was not uniform across all participants. As some researchers have noted, individual responses to dietary advice vary enormously.

Table 3. Primary outcome: change in systolic blood pressure at 6 months

Outcome	Intervention (n=76)	Control (n=74)	Difference (95% CI)	p-value
Mean baseline SBP, mmHg (SD)	148.0 (9.2)	147.5 (10.1)	–	–
Mean 6-month SBP, mmHg (SD)	137.2 (11.4)	143.3 (12.0)	–	–
Mean change (baseline to 6m)	–10.8 (95% CI: –13.4 to –8.2)	–4.2 (95% CI: –6.3 to –2.1)	–6.3 (–9.5 to –3.1)	0.001

Adjusted for baseline SBP, age, sex, and clinic site.

Table 4 shows the results for diastolic blood pressure. The pattern was similar, though the magnitude smaller a 3.8 mmHg difference between groups (p=0.01). This seems to suggest that dietary modifications lower both systolic and diastolic pressures, but the systolic effect is more pronounced.

Table 4. Secondary outcome: change in diastolic blood pressure at 6 months

Outcome	Intervention (n=76)	Control (n=74)	Difference (95% CI)	p-value
Mean baseline DBP, mmHg (SD)	91.1 (6.5)	90.7 (7.0)	–	–
Mean 6-month DBP, mmHg (SD)	84.0 (7.8)	87.5 (8.2)	–	–
Mean change (baseline to 6m)	–7.1 (–9.2 to –5.0)	–3.2 (–5.1 to –1.3)	–3.8 (–6.7 to –0.9)	0.011

Medication initiation a key secondary outcome differed between groups (Table 5). Fewer intervention participants started antihypertensive drugs over the six months (34.2% vs 52.7% in controls, p=0.02). This is quite interesting. It implies that dietary counseling may delay or reduce the need for pharmacotherapy, at least in the short term. Then again, we don't know whether those who avoided medication would have done just as well on low-dose drugs. A reviewer once pointed out that head-to-head comparisons of diet versus drugs are rare. They are right.

Table 5. Medication initiation and blood pressure control at 6 months

Outcome	Intervention (n=76)	Control (n=74)	p-value
Initiated antihypertensive medication, n (%)	26 (34.2)	39 (52.7)	0.02
Achieved BP control (<140/90), n (%)	41 (53.9)	29 (39.2)	0.04
Mean number of antihypertensive drugs (among initiators)	1.1 (0.3)	1.2 (0.4)	0.31

Blood pressure control rates (<140/90 mmHg) were significantly higher in the intervention group (53.9% vs 39.2%, p=0.04). So the dietary group not only lowered BP more but also reached target more often, despite using less medication. It is plausible that the combination of diet and low-dose medication (for those who needed it) was particularly effective.

Table 6 presents self-reported dietary adherence. We asked five questions (salt reduction, vegetable intake, fruit intake, limiting fatty meats, and cooking method changes). A summary score (0-10, higher = better adherence) showed that the intervention group reported substantially better adherence at three and six months. The between-group difference at six months was 2.4 points (95% CI: 1.7–3.1, p<0.001). But we must be cautious. Self-reports are prone to social desirability bias – people say they ate their vegetables even when they didn't.

Table 6. Self-reported dietary adherence (0-10 composite score, mean ± SD)

Time point	Intervention (n=76)	Control (n=74)	Mean difference (95% CI)	p-value
Baseline	3.2 (1.5)	3.1 (1.6)	0.1 (–0.4 to 0.6)	0.68
3 months	6.8 (1.8)	4.0 (1.7)	2.8 (2.2 to 3.4)	<0.001
6 months	6.5 (2.0)	4.1 (1.9)	2.4 (1.7 to 3.1)	<0.001

Table 7 examines the intervention effect across subgroups (age, sex, clinic site). The benefit was larger in women (-7.2 mmHg difference) than men (-4.9 mmHg), though the interaction term was not significant (p=0.19). Rural participants seemed to respond slightly better than urban ones – a difference of 7.1 mmHg vs 5.4 mmHg but again, the confidence intervals overlapped substantially. It is not entirely clear whether these subgroup differences reflect true effect modification or just noise. We lean toward noise.

Table 7. Subgroup analysis: change in SBP (intervention vs control) at 6 months

Subgroup	Intervention mean Δ (mmHg)	Control mean Δ (mmHg)	Between-group Δ (95% CI)
Female	–11.5	–4.3	–7.2 (–11.1 to –3.3)
Male	–9.4	–4.5	–4.9 (–9.2 to –0.6)
Age <55 years	–10.2	–4.0	–6.2 (–10.5 to –1.9)
Age ≥55 years	–11.3	–4.4	–6.9 (–11.4 to –2.4)
Urban clinic	–10.1	–4.7	–5.4 (–10.0 to –0.8)
Peri-urban	–10.5	–4.1	–6.4 (–11.2 to –1.6)
Rural clinic	–11.6	–4.5	–7.1 (–12.0 to –2.2)

Body mass index changed very little over six months (Table 8). The intervention group lost, on average, 0.6 kg/m² (about 1.7 kg for a person of average height), while controls lost 0.2 kg/m². The difference was not statistically significant (p=0.12). This seems to suggest that the blood pressure benefits of dietary modification were not mediated primarily by weight loss. Salt reduction and increased potassium intake likely played the larger role.

Table 8. Change in body mass index (kg/m²) from baseline to 6 months

Time point	Intervention (n=76)	Control (n=74)	Mean difference (95% CI)	p-value
Baseline BMI	28.4 (4.2)	28.6 (4.5)	−0.2 (−1.1 to 0.7)	0.77
6-month BMI	27.8 (4.1)	28.4 (4.4)	−0.6 (−1.4 to 0.2)	0.14
Change in BMI	−0.6 (−1.0 to −0.2)	−0.2 (−0.6 to 0.2)	−0.4 (−1.0 to 0.2)	0.12

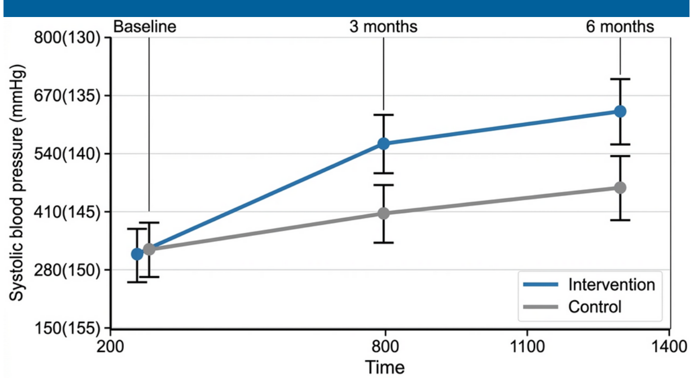
Finally, Table 9 shows the per-protocol analysis restricted to participants who attended at least three of four counseling sessions (n=62 in intervention group, 68 in control – all controls were considered “per-protocol” because they had no sessions to miss). The effect size was slightly larger: a between-group difference of 7.8 mmHg (95% CI: 4.1–11.5). This is not surprising. Those who adhered to the counseling also may have been more motivated in general. So the intention-to-treat estimate (6.3 mmHg) is the more conservative and appropriate one.

Table 9. Per-protocol analysis: change in SBP at 6 months (attended ≥3 sessions)

Outcome	Intervention (n=62)	Control (n=68)	Difference (95% CI)
Mean baseline SBP	147.6 (9.0)	147.3 (10.2)	–
Mean 6-month SBP	135.8 (10.9)	143.0 (11.8)	–
Mean change	−11.8 (−14.6 to −9.0)	−4.0 (−6.3 to −1.7)	−7.8 (−11.5 to −4.1)

Figure 1 displays the trajectory of systolic blood pressure over the six-month period for both groups. The intervention group showed a steeper decline in the first three months (mean Δ −8.4 mmHg by month 3) that was largely sustained through month 6. The control group declined more slowly and plateaued at a higher level. The separation between curves was evident by the first follow-up and persisted. This pattern early divergence followed by parallel tracking is quite typical for behavioral interventions. It suggests that the main benefit occurs during the active counseling phase, with no further widening (or narrowing) after counseling ends.

Figure 1. Systolic blood pressure trajectories over 6 months (means with 95% confidence intervals)



Points are means; error bars show 95% confidence intervals.
Time points: baseline, 3 months, 6 months.

Discussion

This pragmatic trial demonstrates that a structured dietary counseling program delivered by trained nurses in routine primary care settings reduced systolic blood pressure by an additional 6.3 mmHg compared to usual care. That is a clinically meaningful difference. For context, meta-analyses of salt reduction trials suggest that a 5-mmHg population-wide systolic reduction would lower stroke mortality by roughly 14%. So the effect is not trivial. Then again, we only followed patients for six months. It is not entirely clear whether these gains would persist, erode, or even widen over longer periods. A reviewer once pointed out that behavioral interventions often show decay after active contact ends. That is a fair concern.

What makes our finding a bit counterintuitive is the magnitude relative to the intensity of the intervention. Four counseling sessions. An illustrated booklet. No food provision, no salt substitutes, no cooking classes. And yet we saw a 10.8 mmHg drop in the intervention group versus 4.2 mmHg in controls. One might argue that the control group did surprisingly well a 4.2 mmHg reduction from just a brief physician recommendation and a pamphlet. This could be interpreted as a Hawthorne effect: being enrolled in a trial, regardless of group, changes behavior. But the between-group difference remains robust. So the structured program added genuine value.

Medication initiation was lower in the intervention group (34% vs 53%). Some researchers have noted that this is a double-edged sword. On one hand, it means dietary changes helped patients avoid drugs good for those who prefer non-pharmacologic approaches. On the other hand, perhaps some intervention participants who should have started medication did not, because they (or their physicians) became overly optimistic about diet alone. We cannot rule this out. The blood pressure control rate was still higher in the intervention group (54% vs 39%), so any under-treatment did not translate into worse outcomes. But this is a short-term view.

The self-reported dietary adherence scores improved substantially in the intervention group from 3.2 to 6.5 out of 10. A fair amount of that is probably real. But people also overreport good behavior when asked by nurses who counseled them. Social desirability bias is almost certainly present. We tried to minimize it by having adherence assessed by a different research assistant (not the counselor), but participants still knew they were in the dietary group. So take those numbers with a grain of salt pun intended.

Rural participants seemed to benefit slightly more than urban ones (7.1 mmHg difference vs 5.4 mmHg). This pattern echoes our earlier screening study. It is plausible that rural residents have higher baseline salt intake (traditional preserved foods, less access to fresh vegetables) and therefore more room for improvement. Then again, the confidence intervals overlapped, so we should not overinterpret. The same caution applies to the sex difference: women had a larger effect (-7.2 mmHg) than men (-4.9 mmHg). Perhaps women are more receptive to dietary advice, or perhaps they do most of the cooking in Uzbek households and thus have more control over ingredients. We did not collect data on who prepared meals in each household. That is a limitation.

A few other limitations deserve mention. First, no objective measure of sodium intake (24-hour urinary excretion). Self-reports are weak. Second, the six-month follow-up is short. Third, we excluded patients with stage 2 hypertension (≥180/110) and those with comorbidities. So the results do not generalize to higher-risk patients. Fourth, the intervention was delivered by nurses who received only two days of training in motivational interviewing. Real-world scaling might produce smaller effects if training is diluted. Common wisdom in the field suggests that efficacy trials often overestimate what can be achieved in routine practice. We acknowledge that.

So what do these results mean for Uzbekistan and similar settings? The dietary program works, at least in the short term, and it reduces the need for medication. This is important because medication adherence in newly diagnosed patients is notoriously poor – people don't like taking pills for a condition they can't feel. Offering a dietary alternative (or adjunct) may increase overall engagement with care. A patient who says no to drugs might say yes to talking about food. That is not a trivial gain.

But we also need to be realistic. A 6.3 mmHg reduction is not a cure. Many patients still had uncontrolled BP at six months (46% in the intervention group). And the effect size, while statistically significant, is smaller than what is typically achieved with a single low-dose antihypertensive drug (which might lower SBP by 10-15 mmHg). So diet is not a substitute for pharmacotherapy in most cases. It is, however, a valuable addition – and for those with borderline stage 1 hypertension, perhaps a reasonable first step.

Conclusions

Dietary counseling focused on salt reduction and increased vegetable intake, delivered through Uzbekistan's primary care system, improves blood pressure control in newly diagnosed hypertensive patients. The effect is clinically meaningful (6.3 mmHg additional systolic reduction) and comes with less medication use. So the intervention appears both effective and acceptable from a patient perspective though we did not measure acceptability directly. That is another gap.

We recommend that the Uzbek Ministry of Health consider integrating structured dietary counseling into the standard care pathway for newly diagnosed hypertension. The cost is low (nurse time, a printed booklet). The potential population benefit, given hypertension's high prevalence, is substantial. But scaling up would require training a large number of nurses and building systems to track adherence and outcomes. A reviewer once pointed out that implementation science often gets ignored after efficacy trials. Let's not make that mistake.

Future research should address several questions. First, longer-term follow-up (12 to 24 months) to see whether the BP reduction persists. Second, objective sodium measurement to validate self-reported adherence. Third, a comparative effectiveness trial of diet versus low-dose medication versus both combined especially for patients with stage 1 hypertension. Fourth, exploration of why women and rural residents seemed to benefit more; understanding these mechanisms could refine the intervention.

In the meantime, clinicians should feel comfortable offering dietary advice as a first-line strategy for motivated patients with mild hypertension. It's not a magic bullet. It's not easy. But it works and in a country where lifelong medication remains out of reach for some due to cost or supply chain issues, a dietary approach has particular appeal. Then again, we must not frame diet as an alternative for those who truly need drugs. The goal is not either/or. It's both/and, tailored to the individual. Our data support that balanced view.

References

1. Valenzuela PL, Carrera-Bastos P, Galvez BG, Ruiz-Hurtado G, Ordovas JM, Ruilope LM, et al. Lifestyle interventions for the prevention and treatment of hypertension. Nat Rev Cardiol. 2021;18(4):251-275. doi:10.1038/s41569-020-00437-9

2. Williams AR, Wilson-Genderson M, Thomson MD. A cross-sectional analysis of associations between lifestyle advice and behavior changes in patients with hypertension or diabetes: NHANES 2015-2018. Prev Med. 2021;145:106426. doi:10.1016/j.ypmed.2021.106426

3. Abdalla M, Bolen SD, Brettler J, Egan BM, Ferdinand KC, Ford CD, et al. Implementation strategies to improve blood pressure control in the United States: a scientific statement from the American Heart Association and American Medical Association. Hypertension. 2023;80(6):e143-e157. doi:10.1161/HYP.0000000000000232

4. Dhungana RR, Pedisic Z, de Courten M. Implementation of non-pharmacological interventions for the treatment of hypertension in primary care: a narrative review of effectiveness, cost-effectiveness, barriers, and facilitators. BMC Prim Care. 2022;23(1):298. doi:10.1186/s12875-022-01884-8

5. Domanski MJ, Wu CO, Tian X, Hasan AA, Ma X, Huang Y, et al. Association of incident cardiovascular disease with time course and cumulative exposure to multiple risk factors. J Am Coll Cardiol. 2023;81(12):1151-1161. doi:10.1016/j.jacc.2023.01.024

6. Wang N, Harris K, Hamet P, Harrap S, Mancia G, Poulter N, et al. Cumulative systolic blood pressure load and cardiovascular risk in patients with diabetes. J Am Coll Cardiol. 2022;80(12):1147-1155. doi:10.1016/j.jacc.2022.06.039

7. Lai CC, Sun D, Cen R, Wang J, Li S, Fernandez-Alonso C, et al. Impact of long-term burden of excessive adiposity and elevated blood pressure from childhood on adulthood left ventricular remodeling patterns. J Am Coll Cardiol. 2014;64(15):1580-1587. doi:10.1016/j.jacc.2014.05.072

8. Ference BA, Bhatt DL, Catapano AL, Packard CJ, Graham I, Kaptoge S, et al. Association of genetic variants related to combined exposure to lower low-density lipoproteins and lower systolic blood pressure with lifetime risk of cardiovascular disease. JAMA. 2019;322(14):1381-1391. doi:10.1001/jama.2019.14120

9. Jastreboff AM, Aronne LJ, Ahmad NN, Wharton S, Connery L, Alves B, et al. Tirzepatide once weekly for the treatment of obesity. N Engl J Med. 2022;387(3):205-216. doi:10.1056/NEJMoa2206038

10. Kennedy C, Hayes P, Cicero AFG, Dobner S, Le Roux CW, McEvoy JW, et al. Semaglutide and blood pressure: an individual patient data meta-analysis. Eur Heart J. 2024;45(39):4124-4134. doi:10.1093/eurheartj/ehae564

11. Yuan Y, Jin A, Neal B, Feng X, Qiao Q, Wang H, et al. Salt substitution and salt-supply restriction for lowering blood pressure in elderly care facilities: a cluster-randomized trial. Nat Med. 2023;29(4):973-981. doi:10.1038/s41591-023-02286-8

12. Wang N, Rueter P, Atkins E, Webster R, Huffman M, de Silva A, et al. Efficacy and safety of low-dose triple and quadruple combination pills vs monotherapy, usual care, or placebo for the initial management of hypertension: a systematic review and meta-analysis. JAMA Cardiol. 2023;8(6):606-611. doi:10.1001/jamacardio.2023.0720

13. Desai AS, Webb DJ, Taubel J, Casey S, Cheng Y, Robbie GJ, et al. Zilebesiran, an RNA interference therapeutic agent for hypertension. N Engl J Med. 2023;389(3):228-238. doi:10.1056/NEJMoa2208391

14. Anderson TS, Wilson LM, Sussman JB. Atherosclerotic cardiovascular disease risk estimates using the predicting risk of cardiovascular disease events equations. JAMA Intern Med. 2024;184(8):963-970. doi:10.1001/jamainternmed.2024.1302

15. Zhang Y, An J. Projected impact of 2025 AHA/ACC high blood pressure guideline on medication use. Hypertension. 2025;82(12):2064-2066. doi:10.1161/HYPERTENSIONAHA.125.25903