

Table S1 Characteristics of medical checkup and dietary habits in high and low risk hypertension groups in the low barley group.

	High risk	Low risk	<i>p</i> value ⁽¹⁾
	(<i>n</i> = 28)	(<i>n</i> = 37)	
	<i>n</i> (%) or mean (SD)	<i>n</i> (%) or mean (SD)	
Male (<i>n</i>)	24 (86%)	28 (77%)	0.49 ⁽²⁾
Age (years)	52.4 (6.2)	49.9 (6.0)	0.11
Barley intake (g/1000 kcal)	1.5 (1.2)	1.5 (1.3)	0.88
Medications of hypertension drug (<i>n</i>)	10 (36%)	0 (0%)	<0.001 ⁽²⁾
Parents with hypertension (<i>n</i>)	17 (61%)	16(43%)	0.25
Medical checkup			
Weight (kg)	71.0 (12.9)	62.4 (10.7)	0.005
BMI (kg/m ²)	24.4 (4.0)	22.0 (3.3)	0.01
SBP (mmHg)	134 (8)	112 (10)	<0.001
DBP (mmHg)	86 (6)	71 (8)	<0.001
Fasting blood glucose (mg/dL)	97 (10)	95 (16)	0.64
HbA1c (%)	5.6 (0.3)	5.5 (0.4)	0.52
Triglycerides (mg/dL)	124 (53)	126 (105)	0.94
HDL-cholesterol (mg/dL)	62 (12)	60 (17)	0.68
LDL-cholesterol (mg/dL)	130 (31)	118 (26)	0.09
Nutrients			
Energy (kcal/d)	1735 (382)	1763 (561)	0.82
Protein (g/d)	59 (18)	58 (18)	0.79
Fat (g/d)	49 (16)	48 (16)	0.89
Carbohydrate (g/d)	210 (61)	215 (68)	0.75
Sodium chloride (g/d)	10.5 (2.3)	10.2 (3.3)	0.67
Lifestyle			
Smoking (present, past, never) (<i>n</i>)	9, 9, 10 (32%, 32%, 36%)	17, 9, 11 (46%, 24%, 30%)	0.53 ⁽²⁾
With physical activity ⁽³⁾ (<i>n</i>)	9 (32%)	14 (38%)	0.83 ⁽²⁾

⁽¹⁾ High risk group and low risk group were compared using Student's *t* -test.

⁽²⁾ High risk group and low risk group were compared using Pearson's chi-squared test.

⁽³⁾ Light exercise for a total of at least 30 min/day, at least twice a week, for at least 1 year.

Table S2 Measurements of the 50 dominant genera in all participants, responders, non-responders, low risk group, and high risk group subjects.

	All participants (n = 130)			High barley group					Low barley group						
	Mean	Median	[1st Qu , 3rd Qu]	responders (n = 39)			non-responders (n = 26)		<i>p</i> -value	Low risk (n = 37)			High risk (n = 28)		<i>p</i> -value
				Median	1st Qu	3rd Qu	Median	1st Qu		3rd Qu	Median	1st Qu	3rd Qu	Median	
<i>Bacteroides</i>	27.36	26.43	[14.92 , 36.95]	26.05	[16.07 , 34.75]	27.27	[16.00 , 36.66]	0.98	22.95	[13.56 , 35.98]	35.09	[17.44 , 41.72]	0.10		
<i>Prevotella 9</i>	7.07	0.01	[0.00 , 0.03]	0.00	[0.00 , 0.01]	0.01	[0.00 , 24.19]	0.03	0.01	[0.00 , 14.37]	0.01	[0.00 , 0.01]	0.16		
<i>Blautia</i>	6.06	5.15	[2.79 , 8.36]	5.48	[4.01 , 8.95]	3.66	[1.96 , 8.94]	0.12	4.71	[2.55 , 5.71]	5.78	[3.10 , 9.78]	0.15		
<i>Bifidobacterium</i>	6.00	2.94	[1.09 , 7.54]	5.02	[2.33 , 11.40]	3.21	[0.82 , 6.37]	0.09	2.28	[1.31 , 5.83]	2.23	[0.42 , 4.62]	0.47		
<i>Faecalibacterium</i>	4.90	3.36	[0.65 , 7.73]	5.86	[2.09 , 9.28]	1.74	[0.54 , 5.28]	0.02	3.19	[1.17 , 8.21]	2.75	[0.33 , 4.57]	0.40		
<i>Megamonas</i>	3.28	0.00	[0.00 , 3.60]	0.00	[0.00 , 0.01]	0.00	[0.00 , 4.44]	0.09	0.00	[0.00 , 2.05]	0.19	[0.00 , 6.82]	0.31		
<i>Parabacteroides</i>	2.55	1.84	[0.82 , 3.22]	1.30	[0.53 , 2.52]	1.35	[0.91 , 2.19]	0.46	2.28	[1.11 , 4.46]	2.22	[1.39 , 3.56]	0.99		
<i>Sutterella</i>	1.86	1.59	[0.42 , 2.67]	1.35	[0.34 , 2.34]	1.95	[1.05 , 2.88]	0.23	1.25	[0.37 , 2.27]	1.62	[0.64 , 3.43]	0.11		
<i>Lachnoclostridium</i>	1.85	1.35	[0.73 , 2.29]	1.13	[0.71 , 1.75]	2.12	[0.93 , 2.84]	0.02	1.12	[0.72 , 2.12]	1.72	[0.84 , 2.96]	0.11		
<i>Ruminococcus torques</i> group	1.83	1.22	[0.62 , 2.29]	1.06	[0.55 , 1.86]	1.46	[0.50 , 2.76]	0.36	1.47	[0.72 , 2.58]	1.21	[0.73 , 2.04]	0.47		
<i>Collinsella</i>	1.81	1.33	[0.48 , 2.23]	1.00	[0.11 , 2.71]	1.41	[0.83 , 2.41]	0.45	1.43	[0.68 , 2.12]	1.30	[0.36 , 1.89]	0.44		
<i>Eubacterium rectale</i> group	1.67	1.00	[0.07 , 2.46]	1.58	[0.01 , 3.11]	0.40	[0.03 , 2.27]	0.29	0.85	[0.37 , 1.90]	1.06	[0.10 , 2.73]	0.70		
<i>Fusobacterium</i>	1.62	0.00	[0.00 , 0.72]	0.00	[0.00 , 0.43]	0.16	[0.00 , 1.02]	0.08	0.00	[0.00 , 0.01]	0.06	[0.00 , 0.90]	0.10		
<i>Anaerostipes</i>	1.44	0.89	[0.18 , 2.02]	1.53	[0.46 , 3.97]	0.99	[0.30 , 1.84]	0.095	0.49	[0.12 , 1.47]	0.30	[0.09 , 1.88]	0.75		
<i>Subdoligranulum</i>	1.44	0.97	[0.02 , 2.15]	1.69	[0.09 , 2.58]	0.26	[0.00 , 1.39]	0.04	1.24	[0.01 , 2.71]	0.88	[0.11 , 1.88]	0.65		
<i>Fusicatenibacter</i>	1.37	0.94	[0.16 , 2.16]	1.02	[0.49 , 2.20]	0.67	[0.05 , 1.09]	0.16	1.21	[0.10 , 2.27]	0.96	[0.18 , 1.93]	0.55		
<i>Alistipes</i>	1.20	0.40	[0.01 , 1.05]	0.13	[0.01 , 0.85]	0.35	[0.05 , 0.99]	0.33	0.72	[0.07 , 2.18]	0.45	[0.01 , 0.96]	0.21		
<i>Phascolarctobacterium</i>	1.15	0.55	[0.00 , 2.10]	0.17	[0.00 , 1.75]	0.62	[0.00 , 2.22]	0.19	1.20	[0.00 , 2.55]	1.12	[0.02 , 2.20]	0.98		
<i>Eubacterium hallii</i> group	1.09	0.76	[0.17 , 1.57]	0.78	[0.24 , 1.64]	0.66	[0.29 , 1.02]	0.46	0.56	[0.10 , 1.20]	0.83	[0.20 , 1.88]	0.43		
<i>Megasphaera</i>	1.04	0.00	[0.00 , 1.30]	0.00	[0.00 , 0.55]	0.00	[0.00 , 1.42]	0.54	0.00	[0.00 , 1.50]	0.00	[0.00 , 0.97]	0.35		
<i>Prevotella 2</i>	0.95	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.94	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.37		
<i>Roseburia</i>	0.91	0.57	[0.13 , 1.13]	0.62	[0.10 , 1.08]	0.34	[0.13 , 0.86]	0.47	0.67	[0.24 , 1.53]	0.31	[0.13 , 0.93]	0.23		
<i>Alloprevotella</i>	0.86	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.86	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.75		
<i>Klebsiella</i>	0.81	0.00	[0.00 , 0.12]	0.01	[0.00 , 0.23]	0.00	[0.00 , 0.01]	0.21	0.00	[0.00 , 0.03]	0.00	[0.00 , 0.13]	0.71		
<i>Lachnospira</i>	0.78	0.36	[0.02 , 1.05]	0.62	[0.22 , 1.37]	0.15	[0.00 , 0.52]	0.02	0.36	[0.04 , 0.90]	0.51	[0.00 , 1.05]	0.99		
<i>Escherichia Shigella</i>	0.77	0.06	[0.01 , 0.26]	0.06	[0.01 , 0.30]	0.10	[0.03 , 0.31]	0.28	0.05	[0.01 , 0.20]	0.05	[0.00 , 0.20]	0.60		
Prevotellaceae NK3B31 group	0.73	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.36	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.00]	0.80		
Lachnospiraceae uncultured	0.66	0.44	[0.17 , 0.87]	0.44	[0.17 , 0.93]	0.38	[0.15 , 0.79]	0.61	0.48	[0.18 , 0.76]	0.42	[0.25 , 1.00]	0.81		
<i>Ruminococcus 2</i>	0.66	0.00	[0.00 , 1.01]	0.00	[0.00 , 0.94]	0.00	[0.00 , 0.42]	0.80	0.00	[0.00 , 1.05]	0.00	[0.00 , 1.39]	0.63		
<i>Veillonella</i>	0.63	0.02	[0.00 , 0.21]	0.06	[0.01 , 0.34]	0.01	[0.00 , 0.07]	0.10	0.01	[0.00 , 0.04]	0.03	[0.00 , 0.41]	0.24		
<i>Streptococcus</i>	0.61	0.15	[0.03 , 0.53]	0.17	[0.06 , 0.58]	0.12	[0.03 , 0.23]	0.27	0.18	[0.02 , 0.55]	0.12	[0.02 , 0.53]	0.94		
<i>Akkermansia</i>	0.54	0.00	[0.00 , 0.02]	0.00	[0.00 , 0.00]	0.00	[0.00 , 0.01]	0.27	0.00	[0.00 , 0.30]	0.00	[0.00 , 0.03]	0.73		

<i>Butyricoccus</i>	0.54	0.47 [0.27 , 0.74]	0.61 [0.32 , 0.80]	0.48 [0.30 , 0.68]	0.45	0.36 [0.20 , 0.61]	0.55 [0.30 , 0.75]	0.15
<i>Acidaminococcus</i>	0.53	0.00 [0.00 , 0.69]	0.00 [0.00 , 0.88]	0.00 [0.00 , 0.69]	0.86	0.07 [0.00 , 0.82]	0.00 [0.00 , 0.43]	0.24
<i>Dorea</i>	0.50	0.37 [0.18 , 0.66]	0.38 [0.13 , 0.62]	0.45 [0.22 , 0.58]	0.54	0.27 [0.21 , 0.70]	0.33 [0.07 , 0.80]	0.60
Lachnospiraceae UCG-008	0.44	0.29 [0.08 , 0.66]	0.37 [0.10 , 0.69]	0.29 [0.06 , 0.57]	0.51	0.24 [0.08 , 0.55]	0.37 [0.09 , 0.77]	0.70
Ruminococcaceae uncultured	0.42	0.16 [0.05 , 0.56]	0.20 [0.04 , 0.46]	0.11 [0.03 , 0.35]	0.37	0.39 [0.10 , 0.85]	0.12 [0.04 , 0.49]	0.05
Rhodospirillaceae uncultured	0.41	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.00]	0.09	0.00 [0.00 , 0.22]	0.00 [0.00 , 0.00]	0.25
<i>Paraprevotella</i>	0.40	0.00 [0.00 , 0.08]	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.28]	0.13	0.00 [0.00 , 0.17]	0.00 [0.00 , 0.01]	0.87
<i>Ruminococcus 1</i>	0.40	0.00 [0.00 , 0.19]	0.00 [0.00 , 0.64]	0.00 [0.00 , 0.01]	0.14	0.01 [0.00 , 0.37]	0.00 [0.00 , 0.01]	0.06
<i>Parasutterella</i>	0.37	0.02 [0.00 , 0.19]	0.05 [0.00 , 0.41]	0.04 [0.00 , 0.25]	0.96	0.00 [0.00 , 0.08]	0.01 [0.00 , 0.10]	0.84
<i>Barnesiella</i>	0.34	0.04 [0.00 , 0.41]	0.01 [0.00 , 0.20]	0.01 [0.00 , 0.29]	0.77	0.06 [0.00 , 0.82]	0.08 [0.00 , 0.64]	0.72
<i>Dialister</i>	0.28	0.00 [0.00 , 0.26]	0.00 [0.00 , 0.59]	0.00 [0.00 , 0.64]	0.81	0.00 [0.00 , 0.10]	0.00 [0.00 , 0.00]	0.19
Ruminococcaceae UCG-002	0.28	0.00 [0.00 , 0.12]	0.00 [0.00 , 0.02]	0.00 [0.00 , 0.18]	0.11	0.00 [0.00 , 0.25]	0.00 [0.00 , 0.09]	0.42
<i>Mitsuokella</i>	0.26	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.00]	0.81	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.00]	0.04
<i>Eubacterium coprostanoligenes</i> group	0.25	0.00 [0.00 , 0.27]	0.00 [0.00 , 0.17]	0.01 [0.00 , 0.24]	0.78	0.01 [0.00 , 0.53]	0.00 [0.00 , 0.15]	0.34
<i>Ruminiclostridium 5</i>	0.24	0.10 [0.05 , 0.30]	0.09 [0.05 , 0.36]	0.08 [0.02 , 0.22]	0.40	0.16 [0.06 , 0.40]	0.10 [0.05 , 0.23]	0.14
Ruminococcaceae UCG-013	0.24	0.13 [0.03 , 0.31]	0.21 [0.08 , 0.50]	0.08 [0.00 , 0.19]	0.03	0.09 [0.01 , 0.27]	0.13 [0.09 , 0.30]	0.31
<i>Lactobacillus</i>	0.23	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.01]	0.00 [0.00 , 0.00]	0.26	0.00 [0.00 , 0.00]	0.00 [0.00 , 0.00]	0.09
<i>Ruminococcus gauvreauii</i> group	0.21	0.01 [0.00 , 0.23]	0.01 [0.00 , 0.29]	0.01 [0.00 , 0.16]	0.80	0.01 [0.00 , 0.30]	0.01 [0.00 , 0.11]	0.78

p -values are the results of between-group comparisons by Mann–Whitney’s U-test.

Bacteria were defined as dominant genera by selecting the 50 genera with the highest mean relative abundance in all participants.

Table S3 Measurements of six genera specific to responder subjects in responders and non-responders excluding subjects taking medications for hypertension.

	Non-respondents excluding use of hypertension medications (n = 19)			Responders (n = 39)			<i>p</i> -value
	Median	[1st Qu , 3rd Qu]		Median	[1st Qu , 3rd Qu]		
<i>Prevotella 9</i>	0.02	[0.00 , 33.10]		0.00	[0.00 , 0.01]		0.01
<i>Faecalibacterium</i>	1.23	[0.54 , 4.14]		5.86	[2.09 , 9.28]		0.01
<i>Lachnospira</i>	2.53	[1.41 , 2.97]		1.13	[0.71 , 1.75]		0.002
<i>Subdoligranulum</i>	0.22	[0.01 , 1.36]		1.69	[0.09 , 2.58]		0.03
<i>Lachnospira</i>	0.13	[0.01 , 0.43]		0.62	[0.22 , 1.37]		0.02
<i>Ruminococcaceae UCG-013</i>	0.08	[0.01 , 0.15]		0.21	[0.08 , 0.50]		0.02

p -values are the results of between-group comparisons by Mann–Whitney’s U-test.

Table S4 Association between responder characteristic bacteria and hypertension, adjusted for age, sex, BMI, lifestyle-related diseases (fasting blood glucose, LDL-cholesterol), and history of hypertension in parents using logistic regression analysis.⁽¹⁾

Variable	Model 1			Model 2			Model 3					
	R	SE	<i>p</i> value	R	SE	<i>p</i> value	R	SE	<i>p</i> value			
<i>Faecalibacterium</i>	0.21	0.11	0.06	#								
<i>Lachnospiridium</i>				-0.16	0.15	0.31						
Ruminococcaceae UCG-013							4.71	2.28	0.04	*		
Sex (0: Male, 1: Female)	-0.43	1.13	0.70	-0.35	1.07	0.75	0.48	1.25	0.70			
Age (years)	-0.17	0.08	0.03	*	-0.09	0.06	0.10	-0.15	0.07	0.03	*	
BMI (kg/m ²)	-0.13	0.14	0.34		-0.15	0.13	0.25	-0.20	0.15	0.17		
Fasting blood glucose (mg/dL)	-0.08	0.05	0.13		-0.09	0.05	0.088	#	-0.11	0.06	0.053	#
Triglycerides (mg/dL)	0.00	0.01	0.69		0.00	0.00	0.90		0.00	0.01	0.56	
LDL-cholesterol (mg/dL)	-0.02	0.02	0.19		-0.02	0.01	0.14		-0.03	0.02	0.12	
Parents with hypertension (0: Yes, 1: No)	-1.89	1.04	0.07	*	-2.24	0.81	<0.01	**	-2.57	0.91	<0.01	**

Variable	Model 4			Model 5			Model 6					
	R	SE	<i>p</i> value	R	SE	<i>p</i> value	R	SE	<i>p</i> value			
<i>Lachnospira</i>	0.27	0.37	0.46									
<i>Prevotella 9</i>				-0.04	0.03	0.21						
<i>Subdoligranulum</i>							0.40	0.30	0.17			
Sex (0: Male, 1: Female)	-0.59	1.10	0.59	-0.27	1.04	0.79	-0.46	1.08	0.67			
Age (years)	-0.09	0.06	0.09	#	-0.10	0.06	0.08	#	-0.10	0.06	0.07	#
BMI (kg/m ²)	-0.16	0.13	0.23		-0.15	0.13	0.25		-0.13	0.13	0.32	
Fasting blood glucose (mg/dL)	-0.08	0.06	0.164		-0.09	0.05	0.0998	#	-0.10	0.05	0.07	#
Triglycerides (mg/dL)	0.00	0.00	0.82		0.00	0.01	0.64		0.00	0.01	0.83	
LDL-cholesterol (mg/dL)	-0.02	0.01	0.12		-0.02	0.01	0.12		-0.02	0.01	0.16	
Parents with hypertension (0: Yes, 1: No)	-2.27	0.81	<0.01	**	-2.16	0.82	0.01	**	-2.22	0.82	<0.01	**

⁽¹⁾Objective variable is 1: Responder, 0: Non-responder. Variance inflation factor (VIF) was less than 2 for all.

*: *p* < 0.05, **: *p* < 0.01, #: *p* < 0.1

Table S5 Association between responder characteristic bacteria and hypertension, adjusted for age, sex, BMI, lifestyle-related diseases (fasting blood glucose, LDL-cholesterol), and lifestyles (smoking, physical activity) using logistic regression analysis.⁽¹⁾

Variable	Model 1			Model 2			Model 3		
	R	SE	<i>p</i> value	R	SE	<i>p</i> value	R	SE	<i>p</i> value
<i>Faecalibacterium</i>	0.27	0.11	0.015 *						
<i>Lachnospira</i>				-0.30	0.15	0.042 *			
Ruminococcaceae UCG-013							3.96	1.91	0.038 *
Sex (0: Male, 1: Female)	-0.69	1.24	0.58	-0.53	1.15	0.64	0.23	1.22	0.85
Age (years)	-0.25	0.08	< 0.01 **	-0.17	0.06	< 0.01 **	-0.18	0.07	< 0.01 **
BMI (kg/m ²)	-0.07	0.13	0.62	-0.11	0.12	0.38	-0.07	0.12	0.54
Fasting blood glucose (mg/dL)	-0.10	0.06	0.099 #	-0.11	0.06	0.058 #	-0.12	0.06	0.035 *
Triglycerides (mg/dL)	0.00	0.01	0.99	0.00	0.00	0.88	0.00	0.01	0.91
LDL-cholesterol (mg/dL)	-0.01	0.01	0.35	-0.01	0.01	0.39	-0.02	0.01	0.20
Smoking (0: present, 1: past, 2: never)	-0.83	0.55	0.13	-0.79	0.55	0.15	-0.74	0.52	0.16
Physical activity habits (0: yes, 1: no) ⁽²⁾	-1.89	1.04	0.07 #	-2.38	1.08	0.03 *	-1.71	1.01	0.09 #

Variable	Model 4			Model 5			Model 6		
	R	SE	<i>p</i> value	R	SE	<i>p</i> value	R	SE	<i>p</i> value
<i>Lachnospira</i>	0.71	0.43	0.099 #						
<i>Prevotella</i> 9				-0.05	0.03	0.097 #			
<i>Subdoligranulum</i>							0.54	0.30	0.069 #
Sex (0: Male, 1: Female)	-1.28	1.22	0.29	-0.43	1.08	0.69	-0.65	1.11	0.56
Age (years)	-0.17	0.06	< 0.01 **	-0.16	0.06	0.01 *	-0.17	0.06	< 0.01 **
BMI (kg/m ²)	-0.10	0.12	0.41	-0.06	0.11	0.60	-0.04	0.12	0.74
Fasting blood glucose (mg/dL)	-0.08	0.06	0.143	-0.11	0.05	0.052 #	-0.11	0.06	0.053 #
Triglycerides (mg/dL)	0.00	0.00	0.98	0.00	0.00	0.76	0.00	0.01	0.86
LDL-cholesterol (mg/dL)	-0.02	0.01	0.20	-0.02	0.01	0.21	-0.01	0.01	0.37
Smoking (0: present, 1: past, 2: never)	-0.97	0.59	0.10 #	-0.71	0.52	0.17	-0.67	0.53	0.21
Physical activity habits (0: yes, 1: no) ⁽²⁾	-2.26	1.08	0.04 *	-1.53	0.98	0.12	-1.95	1.01	0.05 #

⁽¹⁾Objective variable is 1: Responder, 0: Non-responder. All variance inflation factor (VIF) was less than 2.

⁽²⁾Physical activity habits: Light sweaty activity for a total of at least 30 minutes per day, at least twice a week, for at least 1 year.

*: *p* < 0.05, **: *p* < 0.01, #: *p* < 0.1