

Supplementary tables

Table S1. Alpha diversity indices of gut microbiota in NS controls, OS and RS patients.

Alpha diversity indices	NS controls		OS patients		RS patients		P value		
	Mean	SD	Mean	SD	Mean	SD	NS-OS	NS-RS	OS-RS
Ace	784.340	275.020	900.780	248.900	959.150	93.543	0.003	0.001	0.540
Chao	716.000	259.260	827.950	235.630	839.610	154.020	0.009	0.051	0.616
Shannon	4.306	0.847	4.290	0.978	4.272	0.804	0.595	0.722	0.669
Simpson	0.051	0.046	0.076	0.107	0.056	0.033	0.546	0.225	0.607

NS, non-kidney stone. OS, occasional stone. RS, recurrent stone. SD, standard deviation.

Table S2. Higher bacteria genera in NS controls, OS and RS patients by LEfSe analysis.

Groups	Bacteria (counts, /10,000)	LDA score	P value
NS controls	g__Blautia (448)	3.930	0.006
	g__Coprococcus_2 (59)	3.573	0.011
	g__Eubacterium_hallii_group (167)	3.560	0.003
	g__Fusicatenibacter (89)	3.511	0.004
	g__unclassified_f__Peptostreptococcaceae (95)	3.340	0.010
	g__unclassified_f__Lachnospiraceae (86)	3.338	0.000
	g__Ruminococcaceae_UCG_005 (19)	2.798	0.021
	g__Adlercreutzia (15)	2.776	0.004
	g__Lachnospiraceae_ND3007_group (10)	2.616	0.042
	g__Marvinbryantia (13)	2.446	0.002
OS patients	g__Lachnoclostridium (150)	3.499	0.025
	g__Acinetobacter (28)	3.309	0.000
	g__unclassified_p__Firmicutes (9)	2.989	0.000
	g__Empedobacter (9)	2.943	0.000
	g__Pseudomonas (54)	2.878	0.003
	g__Cellulosilyticum (7)	2.756	0.000
	g__Synechococcus (14)	2.568	0.029
	g__Cetobacterium (12)	2.474	0.013
	g__Ruminococcaceae_UCG_009 (1)	2.419	0.006
	g__Nocardia (1)	2.390	0.000
	g__Litoricola (1)	2.218	0.035
	g__norank_f__Eubacteriaceae (1)	2.192	0.002
	g__Eubacterium (1)	2.166	0.003
	g__Rhodococcus (4)	2.164	0.050
	g__Leuconostoc (6)	2.137	0.007
g__Pedomicrobium (1)	2.090	0.019	
g__Oceanobacillus (3)	2.052	0.003	
RS patients	g__Ruminococcus_gnavus_group (57)	3.307	0.027
	g__Tyzzerella_4 (16)	2.905	0.004
	g__Prevotellaceae_UCG_001 (23)	2.504	0.041
	g__Mangrovibacter (2)	2.340	0.013
	g__Flavonifractor (5)	2.249	0.019
	g__Halomonas (9)	2.231	0.000
	g__Peptoniphilus (1)	2.210	0.003
	g__Geobacter (3)	2.166	0.000
	g__unclassified_f__Planococcaceae (6)	2.154	0.006
	g__Photobacterium (2)	2.153	0.010
	g__Anaerosalibacter (2)	2.143	0.000
	g__Brevinema (4)	2.100	0.000
	g__Lysinibacillus (3)	2.071	0.016
	g__Clostridium_sensu_stricto_18 (2)	2.070	0.014
	g__Paracoccus (4)	2.068	0.006
g__Candidatus_Brocadia (1)	2.065	0.035	

g__Syntrophobacter (1)	2.064	0.037
g__Halothiobacillus (1)	2.042	0.021
g__Fructobacillus (3)	2.006	0.021
g__Hafnia_Obesumbacterium (2)	2.005	0.013
g__Clostridium_sensu_stricto_6 (3)	2.000	0.002

NS, non-kidney stone. OS, occasional stone. RS, recurrent stone. LDA, linear discriminant analysis. LEfSe, linear discriminant analysis Effect Size.

Table S3. Higher bacteria genera in NS controls and kidney stone patients by LEfSe analysis.

Group	Bacteria (counts, /10,000)	LDA score	P value
NS controls	g__Blautia (448)	3.921	0.014
	g__Anaerostipes (127)	3.598	0.010
	g__Coprococcus_2 (59)	3.478	0.004
	g__Fusicatenibacter (89)	3.458	0.021
	g__Eubacterium_hallii_group (167)	3.413	0.004
	g__unclassified_f__Peptostreptococcaceae (95)	3.348	0.002
	g__unclassified_f__Lachnospiraceae (86)	3.278	0.000
	g__Fusobacterium (55)	3.197	0.023
	g__Dorea (78)	3.115	0.027
	g__Ruminococcus_1 (43)	3.103	0.019
	g__Adlercreutzia (15)	2.706	0.001
	g__Marvinbryantia (13)	2.415	0.001
	g__norank_f__Coriobacteriaceae (5)	2.400	0.038
	g__Lachnospiraceae_FCS020_group (7)	2.310	0.005
	g__Coprococcus_3 (28)	2.310	0.045
OS+RS patients	g__Megamonas (424)	3.862	0.024
	g__Lachnoclostridium (150)	3.484	0.007
	g__Acinetobacter (28)	3.205	0.000
	g__Ruminococcus_gnavus_group (57)	3.157	0.007
	g__Parabacteroides (48)	3.145	0.043
	g__Enterococcus (61)	3.011	0.050
	g__Pseudomonas (54)	2.959	0.001
	g__Weissella (34)	2.953	0.010
	g__unclassified_p__Firmicutes (9)	2.821	0.000
	g__Empedobacter (9)	2.808	0.000
	g__Tyzzerella_4 (16)	2.719	0.001
	g__Erysipelatoclostridium (8)	2.684	0.012
	g__Cellulosilyticum (7)	2.610	0.000
	g__Prevotella_2 (15)	2.605	0.002
	g__Prevotellaceae_UCG_001 (23)	2.582	0.012
	g__Flavobacterium (8)	2.547	0.010
	g__Staphylococcus (27)	2.533	0.049
	g__Synechococcus (14)	2.522	0.008
	g__norank_f__Ruminococcaceae (19)	2.457	0.028

g__Sutterella (6)	2.441	0.027
g__Cetobacterium (12)	2.294	0.003
g__Peptoclostridium (6)	2.275	0.018
g__Ruminiclostridium_9 (8)	2.248	0.012
g__Variibacter (10)	2.203	0.020
g__Bradyrhizobium (11)	2.201	0.030
g__Sulfuricurvum (9)	2.174	0.025
g__Halomonas (9)	2.136	0.000
g__norank_f__Xanthobacteraceae (5)	2.133	0.008
g__Nocardia (1)	2.095	0.000
g__Paenisporosarcina (2)	2.094	0.013
g__Leuconostoc (6)	2.088	0.002
g__norank_f__Porphyromonadaceae (11)	2.071	0.025
g__Ralstonia (2)	2.068	0.006
g__Ruminococcaceae_UCG_009	2.062	0.002
g__Geobacter (3)	2.058	0.000
g__Eubacterium (1)	2.048	0.017
g__Streptomyces (7)	2.032	0.041
g__Atopobium (1)	2.009	0.002
g__Rhodococcus (4)	2.003	0.015
g__Aquabacterium (3)	2.003	0.022

NS, non-kidney stone. OS, occasional stone. RS, recurrent stone. LDA, linear discriminant analysis. LEfSe, linear discriminant analysis Effect Size.

Table S4. Potential factors associated with the gut microbiota after propensity score match.

Factors	NS controls (n=24)	KS patients (n=24)	P value	Standardized difference
Gender (male), n (%)	16 (66.7)	14 (58.3)	0.766	0.015
Age (year), mean (standard deviation)	50.83 (8.70)	50.08 (12.86)	0.814	0.008
Fat (More-Fat), n (%)	9 (37.5)	10 (41.7)	1	0.015
Red meat (>100 G/Day), n (%)	4 (16.7)	5 (20.8)	1	0.046
Milk (>250 MI/Day), n (%)	5 (20.8)	4 (16.7)	1	0.025
Fruit (>200 G/Day), n (%)	8 (33.3)	8 (33.3)	1	<0.001
Sitting time (>4 H/Day), n (%)	13 (54.2)	11 (45.8)	0.773	0.081
Sleeping time (<6 H/Day), n (%)	20 (83.3)	21 (87.5)	1	0.073
Smoking (Yes), n (%)	11 (45.8)	11 (45.8)	1	0.038
Family history of stone (Yes), n (%)	4 (16.7)	6 (25.0)	0.722	0.047
Hypertension (Yes), n (%)	2 (8.3)	2 (8.3)	1	0.02
NAFLD (Yes), n (%)	3 (12.5)	4 (16.7)	1	0.018

Table S5. Higher bacteria genera in NS controls and kidney stone patients by LEfSe analysis after propensity score match.

Group	Pathways	LDA score	P value
NS controls	g_Blautia	4.024	0.025
	g__Eubacterium_hallii_group	3.805	0.006
	g_unclassified_f_Peptostreptococcaceae	3.466	0.017
	g_unclassified_f_Lachnospiraceae	3.176	0.047
	g_Collinsella	3.176	0.009
	g_Fusicatenibacter	3.176	0.049
	g_Adlercreutzia	3.039	0.003
	g_Dorea	2.987	0.043
	g__Ruminococcus_gauvreauii_group	2.638	0.014
	g_Coprococcus_1	2.509	0.029
	g_Moryella	2.346	0.013
	g_Howardella	2.285	0.037
	OS+RS patients	g_Lachnospiraceae	3.692
g_Acinetobacter		3.496	0.024
g_unclassified_p_Firmicutes		3.212	0.003
g_Empedobacter		3.078	0.000
g_Erysipelatoclostridium		3.040	0.029
g_Cellulosilyticum		2.880	0.009
g_Cetobacterium		2.740	0.039
g_Defluviitoga		2.548	0.046
g_Enterorhabdus		2.491	0.016
g_Gillisia		2.458	0.011
g_Flavonifractor		2.409	0.002
g_Microbacterium		2.368	0.047
g_Nocardia		2.342	0.027
g_norank_f_Xanthobacteraceae		2.340	0.031
g_Mycoplasma		2.339	0.024
g_Litoricola		2.300	0.026
g_Halomonas		2.275	0.021
g_Peptoniphilus		2.255	0.035
g_Eubacterium		2.230	0.045
g_norank_f_Eubacteriaceae		2.213	0.004
g_Brevundimonas		2.204	0.046
g_Bosea		2.202	0.014
g_Clostridium_sensu_stricto_18		2.190	0.027
g_Geobacter	2.189	0.017	
g_Paracoccus	2.175	0.019	
g_Brevinema	2.159	0.012	
g_Fructobacillus	2.145	0.028	

NS, non-kidney stone. OS, occasional stone. RS, recurrent stone. LDA, linear discriminant analysis. LEfSe, linear discriminant analysis Effect Size.

Table S6. Fecal SCFAs level in NS controls, OS and RS patients.

SCFAs	Concentration of SCFAs			P value
	NS controls (µg/mg)	OS patients (µg/mg)	RS patients (µg/mg)	
Acetic acid	21.4393(10.1007)	44.6567(36.9926)	55.4854(22.6412)	<0.001
Propionic acid	0.0792(0.0517)	0.0762(0.0548)	0.0876(0.0463)	>0.05
Propionic acid-2-methyl	0.0069(0.0068)	0.0055(0.0048)	0.0069(0.0059)	>0.05
Butyric acid	0.0892(0.062)	0.091(0.0498)	0.0906(0.0682)	>0.05
Butanoic acid-3-methyl	0.0061(0.0078)	0.0054(0.0051)	0.0057(0.0079)	>0.05
Pentanoic acid	0.0087(0.0133)	0.0061(0.0107)	0.0031(0.0093)	>0.05
Hexanoic acid	0.0007(0.0008)	0.0007(0.0005)	0.0005(0.0004)	0.0375

SCFAs, short chain fatty acids. NS, non-kidney stone. OS, occasional stone. RS, recurrent stone.