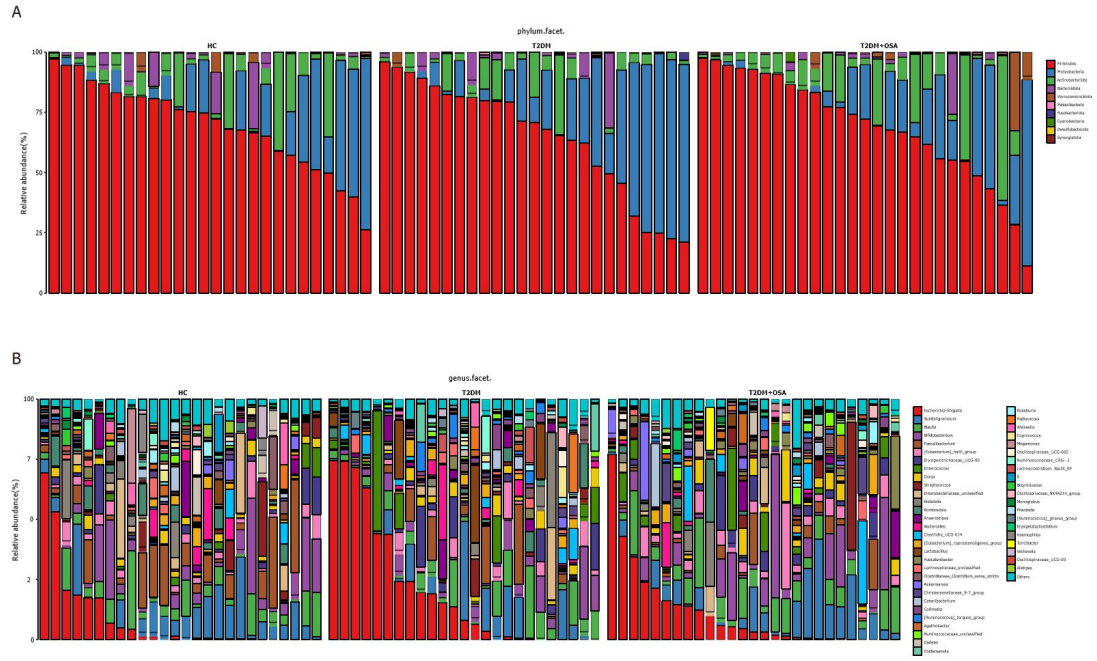


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**Supplementary Figure 1** The  $\alpha$ -diversity curves showed that the microbial richness of samples was close to saturation. A: Shannon-Wiener curve; B: Rarefaction curve; C: Rank abundance distribution curve; D: species accumulation curve.



**Supplementary Figure 2 Histogram for dominant species composition for different classification levels. A: At phylum levels; B: At genus levels.**

**Supplementary Table 1 Inflammatory factors among the three groups**

	HC ( <i>n</i> = 25)	T2DM ( <i>n</i> = 27)	T2DM + OSA ( <i>n</i> = 26)	<i>P</i> value
CRP, mg/L	0.30 (0.30, 0.56)	1.43 (0.66, 1.70)	2.11 (1.63, 2.81) <sup>b,c</sup>	< 0.001
IL-6, pg/mL	1.67 (1.13, 4.51)	2.51 (1.47, 4.51)	3.07 (1.98, 7.22) <sup>b</sup>	0.001
IL-17, pg/mL	10.66 (7.89, 14.86)	11.89 (7.76, 47.85)	29.01 (22.73, 48.95) <sup>b</sup>	< 0.001
TNF- $\alpha$ , pg/mL	62.66 (41.54, 92.64)	56.25 (37.77, 83.07)	100.04 (63.72, 140.26) <sup>a,c</sup>	0.005
TGF- $\beta$ 1, pg/mL	1683.08 $\pm$ 608.59	1360.89 $\pm$ 409.18	1176.91 $\pm$ 515.41 <sup>b</sup>	0.003
LBP, pg/mL	8.59 $\pm$ 6.02	15.99 $\pm$ 11.32	18.07 $\pm$ 13.15 <sup>b</sup>	0.005

Data are presented as the mean  $\pm$  SD or median with interquartile range (IQR).

<sup>a</sup>*P* < 0.05 vs HC; <sup>b</sup>*P* < 0.01 vs HC; <sup>c</sup>*P* < 0.05 vs T2DM; <sup>d</sup>*P* < 0.01 vs T2DM. *P* value:

Comparison of three groups. The *P* value was based on Kruskal-Wallis test or

one way ANOVA. Mann-Whitney U test or LSD t-test was used to compare

two groups. Significant differences were adjusted by Bonferroni correction.

CRP: C reaction protein; IL-6: Interleukin-6; IL-17: Interleukin-17; TNF- $\alpha$ ,

Tumor necrosis factor- $\alpha$ ; TGF- $\beta$ 1: Transforming growth factor  $\beta$  1; LBP:

Lipopolysaccharide binding protein.

**Supplementary Table 2 Statistics of alpha diversity**

	<b>HC</b>	<b>T2DM</b>	<b>T2DM + OSA</b>	<b>P value</b>
Shannon	3.29 (2.89, 3.60)	3.17 (2.65, 3.40)	3.13 (2.60, 3.56)	0.317
ACE	129.09 (89.57, 164.00)	112.00 (91.00, 168.00)	126.00 (86.00, 158.00)	0.879
Simpson	0.08 (0.06, 0.11)	0.09 (0.07, 0.14)	0.10 (0.06, 0.14)	0.219

Data are presented as the median with interquartile range (IQR). The *P* value was based on Kruskal-Wallis rank-sum test.

**Supplementary Table 3 Correlation analysis**

	AHI	Mean Spo2	Lowest Spo2	ODI	FPG	HbA1c	HOM A-IR	HCY	CRP	IL-6	IL-17	TNF $\alpha$	LBP	TGF $\beta$ 1
<i>ASV779 Actinomyces</i>	0.276 <sup>a</sup>	-0.346 <sup>b</sup>	-0.196	0.259 <sup>a</sup>	0.074	0.046	0.078	0.154	0.128	0.055	0.207	0.223 <sup>a</sup>	0.117	-0.277 a
<i>ASV763 Lachnospiraceae_unclassified</i>	-0.228 a	0.109	0.176	-0.156	-0.239 <sup>a</sup>	-0.313 <sup>b</sup>	-0.181	-0.171	-0.291 b	-0.222	-0.031	-0.069	-0.294 b	0.014
<i>ASV266 Lachnospiraceae_unclassified</i>	-0.176	0.181	0.192	-0.208	-0.210	-0.347 <sup>b</sup>	-0.034	-0.292 b	-0.159	-0.156	0.009	-0.076	-0.170	0.010
<i>ASV367 Faecalibacterium</i>	-0.183	0.241 <sup>a</sup>	0.149	-0.236 a	-0.190	-0.268 <sup>a</sup>	-0.084	-0.307 b	-0.172	-0.060	0.021	0.003	-0.091	0.095
<i>ASV436 Faecalibacterium</i>	-0.361 b	0.363 <sup>b</sup>	0.216	-0.291 b	-0.242 <sup>a</sup>	-0.234 <sup>a</sup>	-0.222 <sup>a</sup>	-0.128	-0.283 a	-0.053	0.024	-0.180	-0.154	0.204
<i>ASV1000 [Eubacterium]_eligens_g</i>	-0.289 a	0.286 <sup>a</sup>	0.128	-0.222	-0.126	-0.014	0.074	-0.158	-0.189	-0.194	-0.255 a	-0.177	-0.221	-0.051

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*roup*

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Spearman's correlation coefficient between each ASV and clinical parameter. <sup>a</sup>*P* < 0.05; <sup>b</sup>*P* < 0.01. AHI: Apnea-hypopnea indices; ODI: Oxygen desaturation index; FPG: Fasting plasma glucose; HbA1c: Hemoglobin A1c; HOMA-IR: Insulin resistance index; HCY: Homocysteine; CRP: C reaction protein; IL-6: Interleukin-6; IL-17: Interleukin-17; TNF- $\alpha$ : Tumor necrosis factor- $\alpha$ ; LBP: Lipopolysaccharide binding protein; TGF  $\beta$ 1: Transforming growth factor  $\beta$  1.