

# Exploring childhood lower urinary tract symptoms (LUTS), urinary tract infections (UTI's) and the microbiome - A systematic review

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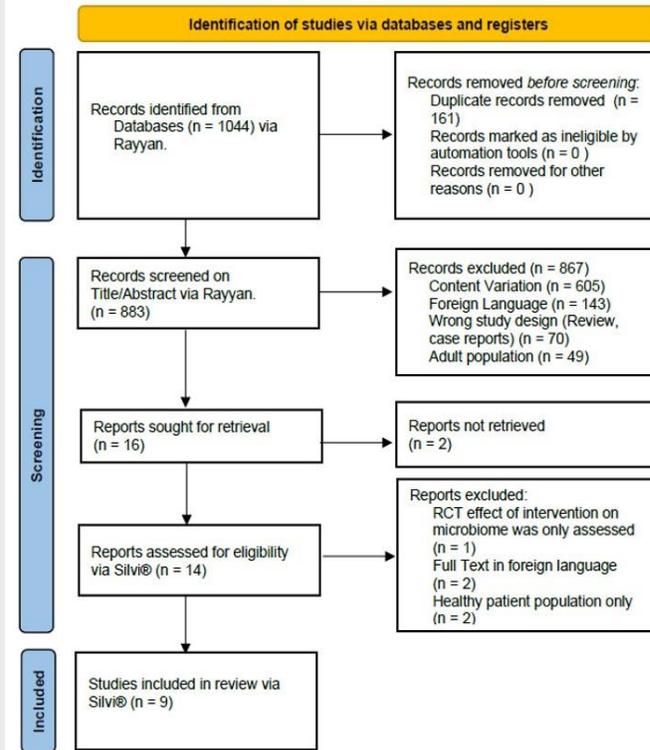
## INTRODUCTION

**Lower Urinary Tract Symptoms (LUTS)** in childhood:  
 → Nocturnal enuresis (NE)  
 → Bladder-Bowel-Dysfunction (BBD)  
 → Urinary tract infections (UTI's)  
 → Vesico-Ureteral Reflux (VUR)

UTI can exacerbate **voiding dysfunction (VD)**

**Urinary & Gut microbiome** influences bladder function (inflammation)  
 → Childhood: role of microbiome **biomarkers** = unclear

## MATERIALS & METHODS



## RESULTS

**SUBJECTS**  
 Pathology: 274 (44,3%)  
 Controls: 345 (55,7%)

**SEX**  
 Male: 38,1%  
 Female: 61,9%

**AGE**  
 5 months  
 – 15 years

**CLINICAL CONDITIONS**  
 UTI, VD, VUR, BBD

Patient sex Male : Female (n : n)	Type of sample	TOTAL Number of patients	Groups	Number of patients per group	Mean Patient Age	Alpha Diversity							
						Chao1-Index	SMD	Shannon-Wiener	SMD	Inverse Simpson	SMD	Pielou	SMD
30 : 76	stool	106	UTI	37	20,3 months	1040 (SD 540,5)	-0,02	5,9 (SD 1,61)	-0,13				
			Control	69	21,8 months	1050 (SD 485,0)		6,09 (SD 1,37)					
19 : 15	urine	34	UTI	11	11 years	311,38 (SD 140,75)	0,13 <sup>1</sup>	1,55 (SD 0,44)	-0,23 <sup>1</sup>				
			ASB	19	8,8 years	156,77 (SD 138,24)	1,54 <sup>2</sup>	1,34 (SD 1,35)	0,14 <sup>2</sup>				
26 : 59	urine	85	UTI	9	382 days	140,34 (SD 100,16)	1,11 <sup>3</sup>	1,82 (SD 0,98)	0,37 <sup>3</sup>				
			Control	76			1,65 (SD 0,44)	3,33					
12 : 37	urine	49	VUR	20	4,8 years								
			controls	13	5,8 years								
20 : 29	stool	49	VD	16	10,2 years								
			Control	25	8,26 years								
0 : 33	urine	33	BBD	25	8,0 years	139,03 (SD 81,25)	-0,41	2,51 (SD 1,68)	-0,71				
			Control	8	6,3 years	170,57 (SD 67,70)		3,52 (SD 0,20)					
42 : 37	Stool	79	UTI	28	5 months	42,5 (IQR 33,5-48,5)	1,4	3,3 (IQR 2,7-3,5)	0,77				
			Control	51	5 months	97 (IQR 69,5-132,0)		3,7 (IQR 3,2-4,6)					
Male	urine	33	Healthy	13	40,1 months			1,75 (SD 0,94)		4,30 (SD 2,71)	0,87	0,65 (SD 0,19)	
				20			2,37 (SD 0,43)	0,91	7,66 (SD 4,46)	0,87	0,73 (SD 0,10)	0,57	
13 : 20	urine	33	0 UTI or Unknown (excluded for analysis)	5				/		/			
			History of 1 UTI	10			2,58 (SD 0,40)	0,58 <sup>4</sup>	8,64 (SD 4,34)	0,32 <sup>4</sup>	0,83 (SD 0,04)	2,38 <sup>4</sup>	
			History of 2 UTI's	8			2,31 (SD 0,55)	0,78 <sup>5</sup>	7,34 (SD 3,65)	1,14 <sup>5</sup>	0,70 (SD 0,07)	0,68 <sup>5</sup>	
			History of 3+ UTI's	10			1,62 (SD 1,07)	1,19 <sup>6</sup>	3,9 (SD 2,43)	1,35 <sup>6</sup>	0,53 (SD 0,32)	1,29 <sup>6</sup>	
74 : 77	stool	151	Gram-positive UTI	53	29,49 weeks								
			Gram-negative UTI										
			Control	98	30,24 weeks								

**MICROBIOME FINDINGS**

**Urinary:** ↓ **Alpha diversity** in UTI & BBD patients  
 Distinct clustering (**β-diversity**) pathology vs. controls  
 Female microbiota shifts at **puberty**, males stable

**Gut:** Altered *Actinobacteria* & *Proteobacteria* in **UTI** patients  
**VD** linked to *F. nucleatum*, *C. Difficile* and *B. Clarus*

**Antibiotics:** ↓ Species richness & diversity  
 (1-14d pre-sample) **Recovery** over time

## INTERPRETATION & CONCLUSION

- **Recurrent UTI's, antibiotics** <-> microbiome alterations
- Sex-based shifts: **development & anatomy** influence?
- Careful **antimicrobial use** in paediatric patients

