Exploring Health-Related Quality of Life, Renal Dysfunction, and Bladder Stone Risks in Individuals with Spinal Cord Injury Using Different Bladder Emptying Methods: Findings from Two National Surveys in China

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Objective: This study explores the HRQoL and the odds ratios (ORs) of bladder stones and renal dysfunction among community-dwelling Chinese individuals with SCI with various bladder emptying methods.

Methods: Two nationwide surveys were conducted across China in 2020 (n=2,983) and 2023 (n=3,027). HRQoL was assessed using the SF-36 questionnaire and reported through Physical Health Composite (PHC) and Mental Health Composite (MHC) Scores[1]. A descriptive analysis reports the average PHC and MHC across respondents with different bladder emptying methods including normal voiding, intermittent catheterization (IC), transurethral indwelling catheterization (TIC), suprapubic indwelling catheterization (SIC), other methods (incl., pads, bladder expression), and mixed methods (combination of IC, TIC, SIC and others). The ORs of renal dysfunction and bladder stones are calculated using 2x2 tables, comparing the frequency of reported complications such as bladder stones and renal dysfunction across bladder management techniques.

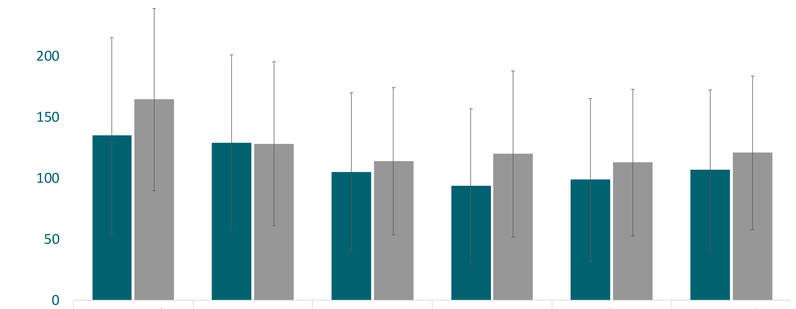
Table 1: Demographics

Characteristics	2020 (n=2,983)	2023 (n=3,027)	P value
Gender, Male (Count, %)	2108 (70.67%)	2082 (68.78%)	0.112
Age (Mean, SD)	44.92 (12.82)	45.84 (11.46)	0.000**
Require wheelchair (Count, %)	2068 (69.33%)	2540 (83.91%)	0.000**
Require caregiver (Count, %)	2349 (78.74%)	1869 (61.74%)	0.000**
Average PHC (Mean, SD)	111.04 (71.20)	128.20 (67.82)	0.000**
Average MHC (Mean, SD)	154.04 (83.18)	182.20 (84.08)	0.000*
Injury type (Count, %)			
Paraplegia	2373 (79.55%)	2343 (77.40%)	0.043*
Tetraplegia	345 (11.56%)	309 (10.20%)	0.091
Don't know or missing inputs	265 (8.88%)	375 (12.39%)	0.000**
Injury location (Count, %)			
Cervical	574 (19.24%)	468 (15.46%)	0.000**
Thoracic	1326 (44.46%)	1361 (44.96%)	0.691
Lumbar	907 (30.40%)	821 (27.12%)	0.005**
Sacral	58 (1.94%)	83 (2.74%)	0.041*
Unknown, missing inputs or others	118 (3.96%)	294 (9.71%)	0.000**
Bladder emptying methods (Count, %)			
Normal Voiding	453 (15.19%)	666 (22.00%)	0.000**
IC	473 (15.86%)	374 (12.36%)	0.493
TIC	229 (7.68%)	245 (8.09%)	0.000**
SIC	110 (3.69%)	70 (2.31%)	0.169
Other methods	1146 (38.42%)	859 (28.38%)	0.000**
Mixed methods	472 (15.82%)	618 (20.42%)	0.000**

*: p<0.05, **: p<0.01 in two-sided test assuming equal variance.

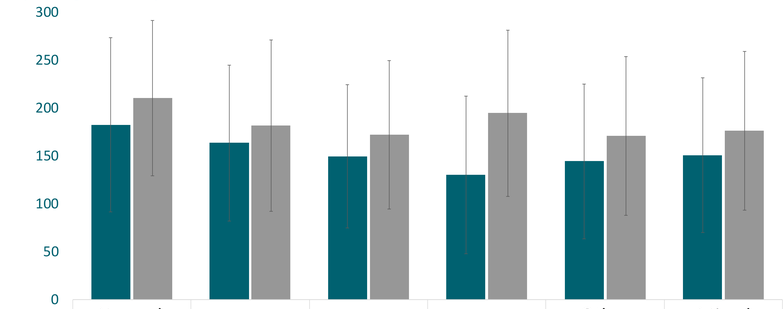
Results: Demographics of respondents are summarized in Table 1. Respondents with normal voiding reported higher PHC and MHC scores than those on IC, TIC, SIC, others and mix methods (p<0.05). In 2020, respondents on IC reported higher PHC than TIC and, SIC, others and mix methods users (p<0.05), a similar but non-significant trend was also observed in 2023 (Figure 1 and Figure 2). The trends observed were similar to those reported in a recent study by Yasmin et al[2].

Figure 1: Mean Physical Health Composite Score of respondents with different bladder emptying technique



	Normal Voiding	IC	TIC	SIC	Other methods	Mixed methods
2020	135.06	128.99	104.87	93.7	98.76	107.05
2023	164.63	128.24	113.85	119.9	112.9	120.86

Figure 2: Mean Mental Health Composite Score of respondents with different bladder emptying technique



	Normal Voiding	IC	TIC	SIC	Other methods	Mixed methods
2020	182.24	163.3	149.37	129.76	144.19	150.62
2023	210.36	181.44	171.87	194.51	170.63	175.79

Respondents on TIC had higher odds of bladder stones and renal dysfunction compared to those on IC, with significance observed only in 2020 data. Respondents on SIC showed significantly higher odds of bladder stones and renal dysfunction compared to those on IC in both years (Table 3 and Table 4). These observations are aligned with the trends observed in other studies [3],[4].

Figure 3: Odds ratio of bladder stones across different bladder emptying techniques

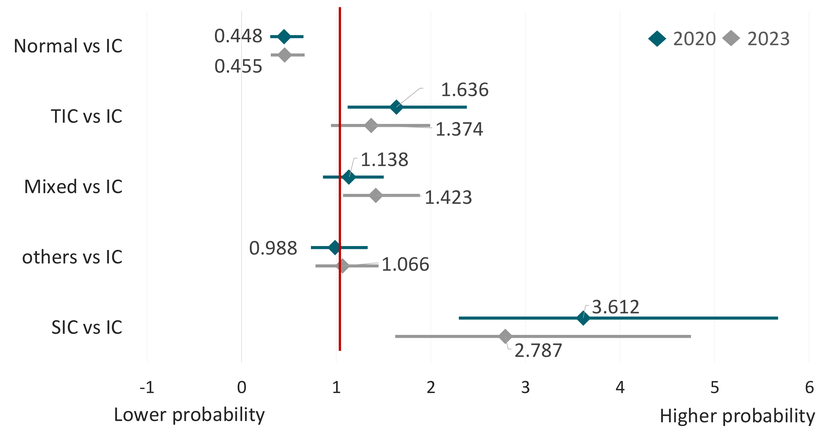
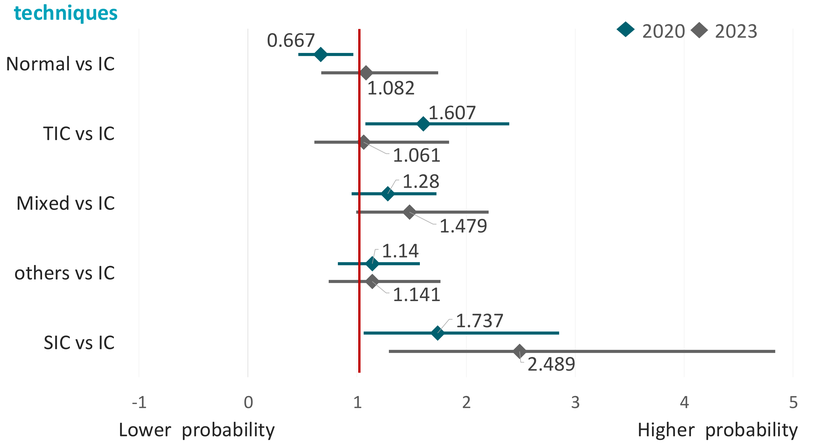


Figure 4: Odds ratio of renal dysfunction across different bladder emptying techniques



Limitations: This study is purely descriptive; further analyses are needed to account for confounders and accurately evaluate the impact of bladder emptying methods on HRQoL and outcomes. Moreover, retrospective patient-reported outcome surveys, may be subject to recall bias and inaccuracies due to patients' limited understanding of their medical conditions. Consequently, additional research is essential to validate these findings.

Conclusion: Respondents using IC had higher PHC scores and lower odds of bladder stones and renal dysfunction compared to those using TIC and SIC. These suggest the need for patient-centered bladder management strategies to optimize HRQoL and reduce the odds of complications such as bladder stone and renal dysfunction.

References:
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