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Health-related quality of life in Chinese patients with chronic prostatitis/chronic pelvic pain syndrome

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Abstract
Objective To examine the health-related quality of life (HRQoL) and factors associated with HRQoL in Chinese patients with chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) using two generic preference-based HRQoL instruments, EQ-5D (plus EQ-VAS) and SF-6D, with the results compared with general population.
Method CP/CPPS patients were recruited from two tertiary referral hospitals, and the general populations were randomly approached. After informed consent, subjects were interviewed using EQ-5D, EQ-VAS and SF-6D, and their socio-demographic and medical information was solicited.
Results Compared to the general population ($n = 364$), CP/CPPS patients ($n = 268$) reported significantly worse HRQoL with median score of the EQ-5D utility index (0.73 vs. 0.85), SF-6D utility index (0.76 vs. 0.81), and EQ-VAS (70.0 vs. 85.0). Multiple linear regression analyses showed pain symptom had the strongest predictive power for HRQoL, compared to symptom duration and urinary symptom. Socio-demographic factors and comorbidities did not significantly contribute to poorer HRQoL.
Conclusion CP/CPPS patients experienced deteriorated HRQoL with lower health-related utility scores compared to general population, and pain severity was the main physical symptom predicting decreased health-related utility. Further studies are needed to provide the reference utility index for the comparison and better characterizing the influence of geographic and cultural factors on variation of health-related utility of CP/CPPS patients.

Keywords Chronic prostatitis · Quality of life · Utility · China

Abbreviations

CP/CPPS	Chronic prostatitis/chronic pelvic pain syndrome
CUA	Cost-utility analysis
HRQoL	Health-related quality of life
MID	Minimally important difference
MLR	Multiple linear regressions
NIH-CPSI	National Institutes of Health Chronic Prostatitis Symptom Index
IQR	Interquartile range

Introduction

Chronic prostatitis/chronic pelvic pain syndrome (CP/CPPS) is a relatively common disease affecting men's health with an estimated prevalence ranging from 2 to 14.2% in western countries and 4.5% in China according to different diagnostic criteria, methodology, and study population [1, 2].

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Clinical manifestation of CP/CPPS typically includes pelvic pain, lower urinary tract, and/or ejaculatory symptoms [3]. Besides physical discomfort, these symptoms also impose psychological stress on patients, with 5% of sufferers showing suicidal tendency because of their symptoms [4]. With the special social cognition normally associating CP/CPPS with sex practice, some patients are embarrassed to talk about the symptoms and the impact on their health-related quality of life (HRQoL) [5]. As such, CP/CPPS is a burdensome disease, which not only incurs substantial healthcare expenditure due to its high prevalence, but also causes significant quality of life impairment in adult men [6, 7]. Primarily, CP/CPPS is a disease of uncertain etiology with no "gold standard" for its treatment currently available [7, 8]. Therefore, the primary goal of CP/CPPS management would be to achieve optimal symptom control and ultimately to improve the patient's HRQoL. Hence, an instrument that can measure the patient's health status would contribute to monitoring disease progression and response to treatments of CP/CPPS. As such, sickness impact profile, SF-36 and CP-specific measure, National Institutes of Health Chronic Prostatitis Symptom Index (NIH-CPSI) are commonly used generic and disease-specific profile-based HRQoL measures for CP/CPPS patients, in which multiple scores for domains are produced [9].

Different from profile-based measures, generic preference-based measures are increasingly used to elicit utility index for calculating quality-adjusted life year (QALY), which is a fundamental component in cost-utility analysis (CUA). CUA has been formally adopted by many countries in health technologies evaluation guidelines leading to reimbursement decision [10–12]. In contrast, few relevant reports utilizing CUA in drug or therapeutic evaluation from China have been found. An important contributing reason of this phenomenon is the lack of familiarity of the approach among clinicians and health administrators and paucity of health utility measurement locally [13].

Since HRQoL impairment is an important adverse outcome of CP/CPPS, its measurement should not be ignored in the management of CP/CPPS patients. This is especially important for Chinese men, as they may be less likely to complain about the impact of CP/CPPS on their HRQoL due to traditional cultural norms and values. In addition, as the management of CP/CPPS patients could potentially involve substantial resource consumption [7], providing outcome measures that can be incorporated into economic evaluation is particularly important for assessing cost-effectiveness of new drugs or approaches in its management. Therefore, in this exploratory study, we chose two preference-based HRQoL instruments, EuroQol (EQ-5D plus visual analogue scale EQ-VAS) and Short Form 6D (SF-6D) to evaluate the HRQoL and elicit health-related utility in Chinese CP/CPPS patients. Results were further compared with those obtained from general population.

For the current study, our first hypothesis was that lower health-related utility would be expected in Chinese CP/CPPS subjects compared with general population [8]. Furthermore, age, symptom duration, symptom severity, and psychological factors, such as anxiety, depression, and identity disorder, were previously reported as determinants of HRQoL in CP/CPPS patients, but disparity existed about their impact [8, 9, 14, 15]. Therefore, the second hypothesis of this study was that these determinants of HRQoL will also influence HRQoL in Chinese CP/CPPS patients.

Methods

Study design and patient recruitment

In this Institutional Review Board approved study, consecutive sample of outpatients with CP/CPPS was recruited from the 306th Hospital of P.L.A in Beijing (northern China) and the First People's Hospital of Yunnan Province in Kunming (southern China), two tertiary referral hospitals in China from December 2008 to April 2009. The choice of two study sites in different parts of China was an attempt to obtain a more representative sample. Patients were eligible if they were aged between 20 and 59 and diagnosed with CP/CPPS by their attending physicians based on clinical symptoms, microscopic examination of expressed prostatic secretion and urine, and transrectal ultrasound features. The main diagnose criteria were that the symptoms of discomfort or pain in the pelvic or perineal region without evidence of urinary tract infection, with or with no test result of >10 leukocytes and <50% lecithin corpuscles per high-power field of expressed prostatitis secretion, and the abnormal imaging of prostate ultrasound.

Accordingly, general populations aged over 20 were approached randomly in Beijing and Kunming to serve as the control group. Other inclusion criteria were ability to comprehend the survey questions and absence of cognitive impairment as assessed by the recruiters.

With informed consent, all participants were required to fill in a standardized questionnaire containing the EQ-5D, EQ-VAS, and SF-6D. Validity of these HRQoL instruments in Chinese general population was previously reported [16, 17]. Other information solicited from the participants included their socio-demographic data and comorbid medical conditions. The symptom severity of the CP/CPPS patients was measured using the NIH-CPSI. The procedure and questionnaire used were identical between two cities.

Instruments

EQ-5D/VAS

The EQ-5D is a generic, preference-based HRQoL instrument with five dimensions including mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Each dimension has three response levels (no problem, some problems, and severe problems). The EQ-5D descriptive system can theoretically generate 243 health states, each of which was assigned a utility score ranging from −0.59 to 1.00. The utility scoring algorithm adopted in this study was developed using time trade-off (TTO)-based preference scores from a UK general population sample [18]. EQ-VAS is a 20-cm vertical visual analogue scale ranging from 100 (best imaginable health state) to 0 (worst imaginable health state) to represent the overall health. Respondents classify and rate their health status on the day of the survey. The simplified Chinese version of EQ-5D/VAS in this study is an official version authorized by the EuroQol Group.

SF-6D

The SF-6D was developed from Short Form 36 (SF-36) by Brazier et al. [19] with six dimensions comprising physical functioning, role-limitations, social functioning, pain, mental functioning, and vitality. Each dimension has 4–6 levels, and thus 18,000 possible health states are defined. The SF-6D utility scoring algorithm used in this study was derived from a representative sample of UK general population with standard gambling (SG) method, ranging from 0.29 to 1.00 [19]. The recall period is 4 weeks. Our study adopted the Hong Kong Chinese version of SF-6D that has been validated in general population by Lam et al. [16] in Hong Kong. The traditional Chinese characters in the Hong Kong Chinese SF-6D were converted into equivalent simplified Chinese characters used in Mainland China. During our study, subjects did not report any concerns regarding phrasing of the Hong Kong Chinese SF-6D.

NIH-CPSI

The NIH-CPSI, a 9-item index, is a commonly used instrument for assessing symptoms and its impact on daily life in men with CP/CPPS [20, 21]. The score of NIH-CPSI ranges from 0 to 43, comprising three subscores including pain (21 scores), urinary symptoms (10 scores), and quality of life (12 scores). NIH-CPSI has been accepted by the International Prostatitis Collaborative Network as the standard and valid instrument for evaluating men with chronic prostatitis symptoms [20, 22]. The Chinese NIH-CPSI has been validated and used wildly in scientific research and clinical observation [1, 23, 24].

Statistical analyses

Descriptive statistics were computed to characterize the sample and the distribution of EQ-5D/VAS and SF-6D. We compared the sample composition based on the socio-demographic characteristic between CP/CPPS patients and general population with Chi-square tests. Kolmogorov–Smirnov test demonstrated that the distributions of EQ-5D/VAS and SF-6D scales scores were skewed; therefore median (interquartile range, IQR) scores were presented unless otherwise indicated, and non-parametric univariate analyses were used. Mann–Whitney *U*-tests were performed to identify the difference between CP/CPPS patients and general population overall and within different subgroups. The difference in HRQoL scores between CP/CPPS patients and general population was further compared using multiple linear regression (MLR) in which the group of subjects were entered as an independent variable and the whole HRQoL scores acted as dependent variable, adjusting for the influences of demographic and socio-economic factors such as age, ethnicity, marriage and working status, education and income level, and place.

For the proportion of respondents to each EQ-5D and SF-6D dimensions, Fisher's exact test or Pearson Chi-squared test was performed where appropriate to test for statistically significant difference between CP/CPPS patients, general men between 20 and 59 years and all general population, with CP/CPPS patients as the reference.

Separate MLRs were run to explore the factors involved in the variation of HRQoL scores of CP/CPPS patients. Each of the EQ-5D, SF-6D, and EQ-VAS scale score acted as the dependent variable. According to our hypothesis, previously reported determinants of HRQoL including socio-demographic factors and clinical conditions (i.e., age, duration, and severity of CP/CPPS symptoms, etc.) [8, 9, 14, 15] were treated as independent variables in two steps in the regression analyses. CP/CPPS-specific clinical conditions including time with CP/CPPS, and NIH-CPSI pain, urinary and quality of life domain scores were entered at first step in model 1 and then adjusted for the influence of other socio-demographic factors and comorbidities in the second model.

To allow for better interpretation of each regression model, we categorized the age into five groups (20–29, 30–39, 40–49, 50–59, and ≥60 years), and the severity of CP/CPPS symptom was classified as mild (NIH-CPSI score: pain 0–4, urinary 0–2, and QoL 0–4), moderate (NIH-CPSI score: pain 5–10, urinary 3–5, and QoL 5–8), and severe (NIH-CPSI score: pain 11–21, urinary 6–10, and QoL 9–12) [25]. Groups with hypothesized better

health status were chosen as the reference group from dummy coded variables, i.e., those who were aged between 20 and 29, non-ethic minority, living in Kunming, married, having ≥12 years education, working with ≥RMB10, 000 monthly household income, and with no chronic or acute disease in last 4 weeks. As Claxon has suggested that decisions should be made based on the mean values, irrespective of existence of statistical significance [26], we also compared the size of differences in HRQoL scores between different groups with minimally important difference (MID) in MLR analyses. A difference of 0.033 or more has been reported to be clinically important in both EQ-5D and SF-6D utility scores [27, 28], while a difference of 5 or more in EQ-VAS is proposed to be clinically important [29]. All analyses were based on subjects who fully completed the questionnaire. Statistical analyses were performed using SPSS version 16.0 (SPSS Inc., Chicago, IL, USA).

Results

Subjects' characteristics and distribution of HRQoL scale scores

The subjects' characteristics and distribution of EQ-5D, SF-6D and EQ-VAS scores were presented in Table 1. Compared to the CP/CPPS patients, subjects from general population had a wider age range, more participants from Kunming, higher education level, more subjects being married, more with chronic diseases but less with acute diseases. These differences may have influence on HRQoL scores and we therefore compared the HRQoL scale scores within different subgroups and corrected using multivariate analyses.

There were significant differences between CP/CPPS patients and general population in three HRQoL scores within most subgroups, with higher scores observed in general population (Table 1). Men aged between 50 and 59 and subjects with ≤6 years education were two subgroups in which all of three instruments failed to discriminate the HRQoL difference between CP/CPPS patients and general population ($P > 0.01$). The overall utility scores of CP/CPPS patients were significantly lower than that of general population with the mean difference of −0.14 (95% Confidence interval, CI: −0.162, −0.116) in EQ-5D, −0.06 (95% CI: −0.075, −0.432) in SF-6D and −12.5 (95% CI: −14.67, −10.36) in EQ-VAS (Table 2). The differences were all statistically significant ($P < 0.001$ with Mann–Whitney *U*-tests and multiple linear regression adjusted for the demographic and socio-economic characteristics).

Distribution of EQ-5D and SF-6D domain responses

The distributions of responses on EQ-5D and SF-6D dimensions are summarized in Table 3. Compared with general population, CP/CPPS patients tended to report poorer health on pain/discomfort, anxiety/depression domains in EQ-5D, and most of the domains in SF-6D. Subjects were least likely to report problems on the mobility, self-care, and usual activities domains in EQ-5D. Similar differences were observed between CP/CPPS patients and men aged between 20 and 59 from the general population.

Multiple linear regression analyses

Table 4 shows the results of MLR analyses addressing EQ-5D and SF-6D utility scores and EQ-VAS score of CP/CPPS patients. With the exception of 4 outliers removed from the model of EQ-5D with casewise diagnostics, all 268 CP/CPPS patients who fully completed the questionnaire were included in the regression analyses. In the models without adjustment of socio-demographic factors and comorbidities, CP/CPPS-specific clinical conditions including time with CP/CPPS, NIH-CPSI pain, urinary and quality of life domain scores explained 20.9% (EQ-5D), 20.5% (SF-6D), and 9.6% (EQ-VAS) of the variation in HRQoL of CP/CPPS patients. As expected, a trend of patients with more severe symptom reporting lower overall HRQoL scores (negative regression coefficients, *B*) was observed in all instruments, with some of these differences being statistically significant but not clinically important. Pain severity grade was the only predictor for worse HRQoL with regression coefficients exceeding MID with statistical significance ($P < 0.05$) in all three scores. After adjusting the effect of socio-demographic and comorbid factors, the R^2 increased significantly for EQ-VAS score ($P = 0.036$) but not significantly for EQ-5D ($P = 0.647$) and SF-6D ($P = 0.066$) utilities and the pattern of symptom influence remained very similar to that seen with no adjustment applied. A negative trend of HRQoL was observed for most of socio-demographic variables according to the hypothesis; however, most of them were neither statistically significant nor achieved MID. Interestingly, patients aged between 50 and 59 tended to report better HRQoL compared to younger patients (<50 years old) after controlling for other factors, as demonstrated by the positive regression coefficients exceeding MID for all three measures. Presence of chronic or acute comorbidities did not significantly decrease the HRQoL of CP/CPPS patients in most of measures, while the exception was the presence of chronic diseases on SF-6D utility scores with regression coefficient over MID ($B = -0.052$, $P < 0.001$). These MLR analyses did not obviously break the standard assumptions of linear regression analyses.

Table 1 Characteristics of patients and univariate analyses for SF-6D, EQ-5D and EQ-VAS scores

	N (%)		*P*	EQ-5D Utility Median (IQR)		*P*	SF-6D Utility Median (IQR)		*P*	EQ-VAS Median (IQR)		*P*
	CP/CPPS patients ($n = 268$)	General Population ($n = 364$)		CP/CPPS patients ($n = 268$)	General Population ($n = 364$)		CP/CPPS patients ($n = 268$)	General Population ($n = 364$)		CP/CPPS patients ($n = 268$)	General Population ($n = 364$)	
Age (years)												
20–29	106 (39.6)	83 (23.0)		0.73 (0.07)	1.0 (0.20)	<0.001	0.74 (0.13)	0.82 (0.14)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
30–39	106 (39.6)	80 (22.0)		0.76 (0.07)	0.93 (0.20)	<0.001	0.73 (0.14)	0.81 (0.10)	<0.001	68.0 (19.0)	88.5 (10.8)	<0.001
40–49	47 (17.5)	86 (23.6)		0.73 (0.07)	1.0 (0.20)	<0.001	0.75 (0.17)	0.82 (0.08)	<0.001	70.0 (21.0)	87.0 (10.0)	<0.001
50–59	9 (3.4)	60 (16.5)		0.81 (0.07)	0.85 (0.27)	0.058	0.73 (0.06)	0.81 (0.12)	0.929	90.0 (13.0)	90.0 (14.0)	0.801
≥60	–	55 (15.1)		–	0.80 (0.31)	–	–	0.72 (0.13)	–	–	80.0 (13.0)	–
Gender			<0.001									
Males	268 (100.0)	173 (47.5)		0.73 (0.07)	1.0 (0.20)	<0.001	0.76 (0.14)	0.82 (0.14)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
Females	–	191 (52.5)		–	0.85 (0.24)	–	–	0.80 (0.09)	–	–	80.0 (15.0)	
Place												
Beijing	173 (64.6)	158 (43.4)		0.73 (0.07)	0.85 (0.20)	<0.001	0.76 (0.12)	0.81 (0.10)	<0.001	70.0 (20.0)	80.0 (20.0)	<0.001
Kunming	95 (35.4)	206 (56.6)		0.73 (0.07)	0.93 (0.20)	<0.001	0.79 (0.16)	0.81 (0.13)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
Ethnicity			0.786									
Ethnic minority	26 (9.7)	33 (9.1)		0.80 (0.08)	0.85 (0.20)	0.001	0.78 (0.20)	0.81 (0.13)	0.492	70.0 (31.3)	80.0 (15.0)	<0.001
Non-ethnic minority	242 (90.3)	331 (90.9)		0.73 (0.07)	0.85 (0.20)	<0.001	0.76 (0.14)	0.81 (0.10)	<0.001	70.0 (20.0)	90.0 (10.0)	<0.001
Years of education			0.009									
≤6	18 (6.7)	27 (7.4)		0.73 (0.07)	0.73 (0.23)	0.671	0.73 (0.10)	0.71 (0.24)	0.694	66.5 (20.0)	70.0 (20.0)	0.100
7–12	118 (44.0)	117 (32.1)		0.73 (0.07)	0.85 (0.23)	<0.001	0.77 (0.15)	0.81 (0.11)	<0.001	70.0 (22.8)	80.0 (20.0)	<0.001
≥12	132 (49.3)	220 (60.4)		0.73 (0.07)	1.0 (0.20)	<0.001	0.75 (0.13)	0.82 (0.10)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
Marriage status			<0.001									
Married	164 (61.2)	273 (75.0)		0.73 (0.07)	0.85 (0.20)	<0.001	0.76 (0.14)	0.81 (0.11)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
Non-married	104 (28.8)	91 (25.0)		0.73 (0.07)	0.85 (0.27)	<0.001	0.76 (0.14)	0.82 (0.11)	<0.001	70.0 (17.5)	80.0 (20.0)	<0.001
Working status			0.206									
Working	218 (81.3)	281 (77.2)		0.73 (0.07)	0.85 (0.20)	<0.001	0.76 (0.14)	0.82 (0.10)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
Not working	50 (18.7)	83 (22.8)		0.73 (0.07)	0.80 (0.28)	<0.001	0.73 (0.13)	0.79 (0.14)	0.015	68.0 (16.8)	80.0 (16.0)	<0.001
Monthly household income (CN ¥)			0.100									
≤1,000 (USD143)	13 (4.9)	23 (6.3)		0.73 (0.10)	1.0 (0.24)	0.002	0.68 (0.16)	0.82 (0.14)	0.058	60.0 (15.0)	80.0 (10.0)	<0.001
1,000–1,499 (USD143-214)	29 (10.8)	34 (9.3)		0.73 (0.07)	0.85 (0.28)	0.017	0.74 (0.13)	0.77 (0.16)	0.37	60.0 (30.0)	80.0 (26.3)	0.002
1,500–2,499 (USD214-357)	73 (27.2)	70 (19.2)		0.73 (0.07)	0.85 (0.20)	<0.001	0.79 (0.17)	0.82 (0.10)	0.002	70.0 (20.0)	85.0 (16.3)	<0.001
2,500–4,999 (USD357-714)	85 (31.7)	113 (31.0)		0.73 (0.07)	0.85 (0.20)	<0.001	0.76 (0.14)	0.82 (0.12)	<0.001	70.0 (18.5)	80.0 (11.5)	<0.001
5,000–9,999 (USD714-1428)	47 (17.5)	83 (22.8)		0.73 (0.07)	1.0 (0.20)	<0.001	0.73 (0.10)	0.82 (0.10)	<0.001	70.0 (21.0)	50.0 (10.0)	<0.001
≥10,000 (USD1428)	21 (7.8)	41 (11.3)		0.73 (0.10)	0.85 (0.20)	0.001	0.77 (0.07	0.81 (0.10)	0.033	75.0 (23.5)	84.0 (15.5)	0.001

Table 1 continued

	N (%)		*P*	EQ-5D Utility Median (IQR)		*P*	SF-6D Utility Median (IQR)		*P*	EQ-VAS Median (IQR)		*P*
	CP/CPPS patients ($n = 268$)	General Population ($n = 364$)		CP/CPPS patients ($n = 268$)	General Population ($n = 364$)		CP/CPPS patients ($n = 268$)	General Population ($n = 364$)		CP/CPPS patients ($n = 268$)	General Population ($n = 364$)	
Presence of chronic medical condition			0.003									
Yes	59 (22)	119 (32.7)		0.71 (0.09)	0.80 (0.13)	<0.001	0.71 (0.14)	0.77 (0.11)	0.002	67.0 (20.0)	80.0 (15.0)	<0.001
No	209 (78)	245 (67.3)		0.76 (0.10)	1.0 (0.19)	<0.001	0.76 (0.13)	0.82 (0.10)	<0.001	70.0 (20.0)	85.0 (10.0)	<0.001
Presence of acute medical condition			<0.001									
Yes	135 (50.4)	127 (34.9)		0.73 (0.07)	0.80 (0.12)	<0.001	0.76 (0.14)	0.79 (0.10)	0.002	70.0 (20.0)	80.0 (15.0)	<0.001
No	133 (49.6)	237 (65.1)		0.73 (0.07)	1.0 (0.15)	<0.001	0.76 (0.12)	0.82 (0.10)	<0.001	70.0 (20.0)	87.0 (10.0)	<0.001
Months with CP/CPPS												
≤3	47 (17.5)	–	–	0.73 (0.12)	–	–	0.77 (0.12)	–	–	70.0 (15.0)	–	–
4–6	59 (22.0)	–	–	0.73 (0.07)	–	–	0.74 (0.12)	–	–	70.0 (15.0)	–	–
7–12	55 (20.5)	–	–	0.73 (0.07)	–	–	0.76 (0.11)	–	–	70.0 (20.0)	–	–
13–18	39 (14.6)	–	–	0.73 (0.07)	–	–	0.73 (0.15)	–	–	61.0 (28.0)	–	–
19–24	26 (9.7)	–	–	0.76 (0.07)	–	–	0.76 (0.12)	–	–	66.5 (20.00)	–	–
≥24	42 (15.7)	–	–	0.73 (0.07)	–	–	0.75 (0.16)	–	–	75.0 (20.0)	–	–

Self-reported chronic medical conditions included diabetes mellitus, hypertension, heart disease, stroke, asthma or lung diseases, bone or muscle illnesses, and mental illnesses. Self-reported acute medical conditions included upper respiratory tract infections, vomiting, diarrhea, headache, insomnia, and injuries. Recall periods are 4 weeks

Table 2 Overall scores of HRQoL instruments

		CP/CPPS patient	General population	Difference
EQ-5D	Mean (95% CI)	0.73 (0.72, 0.75)	0.87 (0.86, 0.89)	−0.14 (−0.162, −0.116)[a,b]
	Median (IQR)	0.73 (0.07)	0.85 (0.20)	
SF-6D	Mean (95% CI)	0.75 (0.74, 0.76)	0.81 (0.80, 0.82)	−0.06 (−0.075, −0.043)[a,b]
	Median (IQR)	0.76 (0.14)	0.81 (0.11)	
EQ-VAS	Mean (95% CI)	69.2 (67.44, 70.85)	81.7 (80.34, 82.98)	−12.5 (−14.67, −10.36)[a,b]
	Median (IQR)	70.0 (20.0)	85.0 (12.0)	

95% CI 95% confidence interval, *IQR* interquartile range

[a] $P < 0.001$ with Manny–Whitney *U*-test

[b] $P < 0.001$ with multiple linear regression adjusted for the demographic and socio-economic characteristics

Discussion

In this cross-sectional study, we used both EQ-5D and SF-6D, two generic preference-based instruments to assess HRQoL of Chinese CP/CPPS patients and investigate the effect of socio-demographic and clinical factors on health-related utility scores. Our findings revealed that the health-related utility scores were significantly lower in men with CP/CPPS when compared to general population or men in same age range. Pain severity was the main predictor in decreased HRQoL scores of CP/CPPS patients. Our findings further underscore the HRQoL impairment of CP/CPPS patients and identify potential factors that may be modulated to improve HRQoL in Chinese CP/CPPS patients. Meanwhile, with the use of two preference-based HRQoL measures, it provided some reference utility values of EQ-5D and SF-6D in China for the first time.

Theoretically, multiple comparisons in the analyses may have the problem of inflated rate of false positives; however, the necessity of adjustments is controversial [30]. In subgroup analyses, we restricted our significance level to 0.01 without formal adjustments because firstly, the overall difference between CP/CPPS patients and general population was highly significant ($P < 0.001$ with/without adjustment of demographic and socio-economic factors) (Table 2); and additionally, in the subgroup analyses, most of the *P*-values were also less or close to 0.001 (Table 1). Therefore, in this exploratory study, we did not adjust for the multiple comparisons to avoid inflating the rate of false negatives unnecessarily.

In our study, the overall utility scores of CP/CPPS patients were significantly lower than that of general population with the magnitude of difference obviously exceeding previously reported MID of 0.074 for EQ-5D, 0.033 for SF-6D, while 5 for EQ-VAS [27–29]. The health-related utility of general population in our study was estimated at 0.85 in EQ-5D and 0.81 in SF-6D, close to the results from United States (0.83 in EQ-5D and 0.79 in SF-6D) [31] and the United Kingdom (0.85 in EQ-5D and 0.80 in SF-6D) [32] (Table 1). To our best knowledge, reference utility values for EQ-5D and SF-6D have not been available for CP/CPPS patients until now, and no norms for general population can be found in China. The EQ-VAS score of general population in this study is higher than the results from Wang et al. [17] in China (85.0 vs. 77.0) but very similar to the figures from United Kingdom (82.5) and United States (82.2) [33, 34]. With this baseline reference, it would be easier to compare the results from this study with other publications.

Specifically, compared with general population or men from the general population aged between 20 and 59, the lower ratings of CP/CPPS patients in domains concerning physical pain and mental health in EQ-5D and in SF-6D indicated the obvious impact of these domains on patients' HRQoL (Table. 3). This is consistent with previous reports that pain and psychological problems cause significant HRQoL impairment [6, 8, 9]. Indeed, men with CP/CPPS may experience more severe psychological stress because of the special social cognition about this disease. Moreover, psychological stress may exacerbate dysfunction of the prostate, pain symptom, and sexual dysfunction of the CP/CPPS sufferers [9]. This is further supported by the observation by Tripp et al. [5] that men with CP/CPPS often harbor fear of the possibility of infecting a partner and are embarrassed to see a physician about the pelvic symptoms. Specifically, the psychological impact would even be more significant in Chinese men because of traditional cultural norm in China. In addition, patients also may worry about the impact of disease on their fertility and sex life, especially in the younger age group who were at the age of starting to have family. This could be an explanation for our observation why all three instruments failed to detect any difference between our subgroup of CP/CPPS patients aged 50–59 and general population (Table 1) and from MLR in which patients aged 50–59 tended to report better HRQoL than younger age groups (Table 4). An implication of this is that patients, especially younger patients, will need more psychological counseling

Table 3 Distribution of EQ-5D and SF-6D results within each domain

Level	Mobility	Self-care	Usual activities	Pain/ discomfort	Anxiety/ depression
EQ-5D (%)					
CP/CPPS patients ($n = 268$)					
1	**97.0**	**100.0**	**93.7**	17.9	30.6
2	3.0	0.0	6.3	**81.3**	**62.3**
3	0.0	0.0	0.0	0.7	7.1
P	Reference	Reference	Reference	Reference	Reference
Males 20–59 ($n = 146$)					
1	**95.2**	**97.9**	**95.9**	**71.9**	**70.5**
2	4.8	2.1	4.1	28.1	29.5
3	0.0	0.0	0.0	0.0	0.0
P	0.347	0.043	0.343	<0.001	<0.001
General population ($n = 364$)					
1	**91.8**	**97.5**	**93.7**	**62.6**	**66.5**
2	8.2	2.5	6.0	37.1	33.2
3	0.0	0.0	0.3	0.3	0.3
P	0.006	0.012	0.684	<0.001	<0.001

Level	Physical functioning	Role limitation	Social functioning	Pain	Mental health	Vitality
SF-6D (%)						
CP/CPPS Patients ($n = 268$)						
1	**51.9**	**38.4**	**55.6**	7.8	11.2	7.5
2	39.2	14.9	27.2	43.3	**43.3**	**42.2**
3	8.6	26.1	14.6	**33.6**	33.6	34.3
4	0.0	20.5	1.9	13.1	8.6	12.7
5	0.0	–	0.7	1.5	3.4	3.4
6	0.4	–	–	0.7	–	–
P	Reference	Reference	Reference	Reference	Reference	Reference
Males 20–59 ($n = 146$)						
1	**60.3**	**76.0**	**82.9**	39.0	23.3	34.9
2	34.2	15.1	14.4	**43.2**	**63.7**	**48.6**
3	0.7	7.5	2.1	13.7	12.3	13.7
4	3.4	1.4	0.7	2.7	0.7	2.1
5	0.7	–	0.0	1.4	0.0	0.7
6	0.7	–	/	0.0	/	/
P	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
General Population ($n = 364$)						
1	**50.0**	**69.5**	**77.5**	28.6	14.8	18.7
2	37.4	14.3	15.7	**45.3**	**65.4**	**53.0**
3	6.3	14.0	4.4	17.9	17.9	20.6
4	4.4	2.2	1.4	4.7	1.4	6.3
5	0.8	/	1.1	2.5	0.5	1.4
6	1.1	/	/	1.1	/	/
P	0.006	<0.001	<0.001	<0.001	<0.001	<0.001

Level in mode is in bold

and appropriate education program to help them learn more about CP/CPPS and ease the stress produced by the abnormal test results.

In MLR analyses with and without adjustment of socio-demographic factors, the results showed that pain symptom was the only physical symptom significantly associated

Table 4 Multiple linear regression analyses for HRQoL scores of CP/CPPS patients

Independent variables	EQ-5D Coefficient	*P*	SF-6D Coefficient	*P*	EQ-VAS Coefficient	*P*
Model 1						
R^2	0.209	<0.001	0.205	<0.001	0.096	0.006
Months with CP/CPPS (vs. ≤ 3)						
4–6	−0.031	0.254	−0.019	0.286	−4.199	0.130
7–12	0.023	0.412	0.010	0.595	0.757	0.789
13–18	−0.029	0.340	−0.027	0.161	−6.078	0.046
19–24	−0.012	0.732	−0.006	0.781	−7.340	0.033
≥24	0.002	0.954	−0.028	0.159	0.522	0.864
NIH-CPSI Pain (vs. 0–4)						
5–10	−0.053	0.025	−0.067	<0.001	−5.864	0.014
11–21	−0.111	<0.001	−0.086	<0.001	−8.048	0.011
NIH-CPSI Urinary (vs. 0–2)						
3–5	−0.024	0.224	−0.009	0.464	−2.728	0.168
6–10	−0.043	0.078	−0.020	0.211	−5.018	0.043
NIH-CPSI QoL (vs. 0–4)						
5–8	−0.011	0.715	−0.034	0.078	−4.239	0.158
9–12	−0.105	0.001	−0.073	<0.001	−2.628	0.415
Model 2						
R^2	0.251	<0.001	0.282	<0.001	0.191	0.002
Age (vs. 20–29)						
30–39	−0.001	0.950	−0.003	0.815	−3.063	0.156
40–49	−0.014	0.630	0.000	0.979	0.451	0.875
50–59	0.033	0.532	0.045	0.172	11.164	0.031
Beijing (vs. Kunming)	0.008	0.691	−0.002	0.851	−1.448	0.461
Ethic minority	−0.038	0.223	−0.020	0.312	−4.761	0.118
Married	−0.009	0.669	0.002	0.895	2.922	0.141
Non-working	−0.037	0.156	−0.030	0.067	−3.085	0.229
Years of education (vs. ≥12)						
≤6	0.002	0.960	−0.018	0.506	4.988	0.235
7–12	−0.032	0.115	0.001	0.924	−0.719	0.718
Monthly household income (CN ¥, vs. ≥10,000)						
≤CN ¥ 1,000	−0.027	0.631	−0.040	0.256	−9.609	0.082
CN ¥ 1,000–1,499	−0.015	0.749	−0.008	0.786	−5.281	0.239
CN ¥ 1,500–2,499	−0.030	0.420	−0.028	0.243	−1.458	0.694
CN ¥ 2,500–4,999	−0.025	0.473	−0.006	0.779	−2.757	0.428
CN ¥ 5,000–9,999	−0.019	0.609	−0.032	0.177	0.468	0.899
Presence of chronic disease	−0.040	0.065	−0.052	<0.001	−4.114	0.056
Presence of acute disease	0.008	0.671	−0.002	0.883	−0.151	0.931
Months with CP/CPPS (vs. ≤3)						
4–6	−0.028	0.322	−0.018	0.309	−3.605	0.190
7–12	0.030	0.311	0.014	0.445	0.103	0.971
13–18	−0.022	0.477	−0.019	0.341	−6.551	0.036
19–24	−0.009	0.787	−0.007	0.759	−7.258	0.035
≥24	0.008	0.794	−0.021	0.289	0.681	0.826
NIH-CPSI Pain (vs. 0–4)						
5–10	−0.056	0.027	−0.063	<0.001	−4.496	0.071
11–21	−0.107	0.001	−0.081	<0.001	−6.702	0.036

Table 4 continued

Independent variables	EQ-5D Coefficient	*P*	SF-6D Coefficient	*P*	EQ-VAS Coefficient	*P*
NIH-CPSI Urinary (vs. 0–2)						
3–5	−0.019	0.340	−0.006	0.670	−2.887	0.151
6–10	−0.045	0.076	−0.021	0.181	−4.910	0.048
NIH-CPSI QoL (vs. 0–4)						
5–8	−0.046	0.155	−0.045	0.027	−5.897	0.062
9–12	−0.137	<0.001	−0.086	<0.001	−4.184	0.215

with lowing HRQoL in all three instruments (Table 4). This was in accord with the results from Wenninger et al. [8] but differed from other studies where pain, urinary symptoms, and symptom duration all contribute significantly to predicting HRQoL of patients [21, 25]. However, we did not observe the influence of symptom duration on the health-related utility scores, and the urinary symptom effect was not statistically significant in EQ-5D and SF-6D. Considering CP/CPPS patients may experience a waxing and waning of symptoms during the progress of disease [14], the relationship between time with CP/CPPS and HRQoL observed in our current study would be reasonable. Other possible reasons of the discrepancies among studies would include different study processes in terms of study design, measurement instruments, and study cohort. Indeed, we did observe different explanatory factors for EQ-VAS scores when compared to SF-6D and EQ-5D scores. However, it may also reflect a true difference in CP/CPPS patients' experience in HRQoL impairment among different countries and cultural backgrounds as reported in men with benign prostate hypertrophy [35].

With no reference utility score of EQ-5D and SF-6D from other countries, we cannot compare the variation of utility scores among different contexts. However, with the discrepancies of HRQoL experienced by CP/CPPS patients mentioned above we cannot rule out the possibility of utility variation among different geographic and cultural backgrounds. The issue of discrepancy of health-related utility index among different contexts confounds geographically transferability of economic evaluation [36]. We found that inclusion of selected socio-demographic factors, including two different cities in China, was not significantly associated with health-related utility variation of CP/CPPS patients. On one hand it may ease the problem of generalization of results among different contexts, and on the other hand, it inferred that more factors relevant to the geographic and cultural backgrounds might need to be included for the explanation of above discrepancies. Further researches are therefore needed to resolve the inconsistent results among different geographic and cultural backgrounds.

Finally, the strengths of the present study include its first use of preference-based HRQoL measures, EQ-5D, and SF-6D, in CP/CPPS patients and direct comparison made with general population. Noticeably, even though these two generic HRQoL questionnaires are convenient for comparison between different subject groups and can produce utility index, which can be incorporated into economic evaluation, they are not disease specific and the detrimental effect observed in the CP/CPPS patients here might be found, at least in a few patients, somewhere else than in the CP/CPPS complex. Our study also had several other limitations. First, as a cross-sectional study, it cannot draw the temporal relationship or causal inferences between various factors and worsening HRQoL in CP/CPPS patients. Second, using utility estimates from UK standardized algorithm is a limitation in this Chinese population but that is the best available alternative. Third, in the MLR we have not corrected HRQoL scores for depression, anxiety and other psychological factors influencing CP/CPPS patients' HRQoL and that may decrease the power of the models to explain the variance. A fourth limitation was that the subjects recruited for the general population group in this exploratory study were randomly approached and with a relatively high percentage of participants with better education and higher income and hence may not be truly representative. Further nation-wide survey with larger sample size and well-designed sampling process is needed to provide the norms of EQ-5D and SF-6D utility index in China to facilitate the generalization of health-related utility scores from different contexts.

Conclusion

In conclusion, by using two preference-based HRQoL instruments, EQ-5D and SF-6D, we found that CP/CPPS patients experienced deteriorated HRQoL with lower health-related utility scores compared to general population. Pain severity was the main physical symptom predicting decreased health-related utility. However, further studies are needed to provide the reference for the comparison and better

characterizing the influence of geographic and cultural background in variation of health-related utility of CP/CPPS patients.

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