Original Article

Nocturia and effect on the quality of life. A study at Ramathibodi Hospital

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Abstract

Objective: To investigate the impact and the incidence of nocturia on the quality of life of patients in Ramathibodi Hospital.

Materials and Methods: This study was a hospital-based cross-sectional study to measure the QoL of nocturia patients using a Nocturia Quality-of-Life questionnaire (N-QoL). Cronbach's alpha coefficient was used to explore internal consistency. Pearson's correlation coefficient (r) was used to determine the strength of the relationship between the scores for each item. Uni- and Multivariate analyses were used to explore the significant parameters.

Results: One hundred and fifty-five nocturia patient were included in the study analysis. Most of the questionnaire respondents were male (80.65%) and the vast majority had at least 1 underlying disease requiring long-term follow-up by a physician (86.45%) with a median urination of 3 times per night and a 3 hour median first urination after retiring to bed. From our study questionnaire, most patients responded that they had moderate to good quality of life with a minor inconvenience from nocturia, requiring them to nap during the day on some days. An increasing frequency of urination per night and a first urination of less than 2 hours after retiring is significantly related to low levels of energy the next day, sleep deprivation, worry over treatment options, overall inconvenience and a reduction in quality of life.

Conclusion: Our study demonstrated nocturia patients experience a significant reduction in quality of life, and a decrease in quality of sleep. The incidence of urination in the night and the timing of the first urination after bed had more impact on overall quality of life.

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Introduction

Nocturia, as defined by The International Continence Society (ICS), is waking up to urinate at night after falling asleep and after urinating the patients returns to bed.[1] This is a common condition, especially in patients with lower urinary tract disease such as benign prostatic hyperplasia (BPH). The prevalence of nighttime urination has been recorded as 25.2% in men and 31.3% in women,[2,3] with an increase in incidence with older age[4]. The prevalence of nocturia in women attending the menopause clinic in Ramathibodi was 40.3%.[5] Many elderly patients have to wake up and urinate every hour after going to bed, resulting in insufficient rest and an inability to work efficiently the next day.[6] Some patients also have a risk of falling while waking up to urinate.[7] Some studies have shown that patients who wake up to urinate at night have more depression problems than those who sleep well throughout the night.[8] It has also been found that people without nocturia had a longer survival rate than those who needed to wake up to urinate at night.[9]

Nocturia has been classified into four main categories including nocturnal polyuria, diminished nocturnal and/or global bladder capacity, global polyuria and mixed nocturnal polyuria and diminished nocturnal and/or global bladder capacity. However, in individual cases, more than one of these etiologies might be involved.[10] If the patient is diagnosed, investigated for the underlying cause and receives the correct treatment a decrease in the frequency of night urination is possible. The aim of this study is to assess the effects of nocturia and the frequency of nocturia on the quality of life in Thai patients.

Materials and Methods

Study design

This study was a cross-sectional and questionnaire-based survey conducted among nocturia patients at the outpatient unit of Department of Surgery, Ramathibodi Hospital. The study was approved by the Ethical Clearance Committee on Human Rights Related to Research Involving Human Subjects of the hospital (Study Code: ID 02-60-23).

Participants

The recruitment criteria were: patients with nocturia, of either gender, aged between 25 and 75, and had the capacity to answer the questionnaires. Nocturia was defined as waking to void at least once in the night over the past month. Written informed consent was obtained from all patients who met the eligibility criteria.

Study questionnaire

The effect of nocturia on quality of life (QoL) was studied using the Nocturia Quality-of-Life questionnaire (N-QoL) developed by Abraham et al.[11] The questionnaire was translated into Thai language by a proficient in English translator and verified by two independent urologists. We sought and received permission by email from the original team who constructed the ICIQ, N-QOL questionnaire. The N-QoL questionnaire consists of 13 questions, 12 questions (Q1-Q12) being directly related to nocturia and 1 a global QoL item. Questions 1-12 were divided into two subscales a sleep/energy domain (Q1-Q7, with the exception of Q6) and a bother/concern domain (Q6-Q12). Each question has 5 answers. The scores for each question range from 0-4 (5-point scale), reflecting most impact to no impact. The score with higher values indicating increased impact on quality of life.

The N-QoL overall score is the total of the scores from Q1-Q12. Total subscale scores are calculated from the scores of the questions in the specific domain.

Statistical analysis

Descriptive statistics were used to describe the characteristics of the respondents and summarized the quality of life of the patients. The internal consistency reliability of the translated N-QoL questionnaires was calculated and presented using Cronbach's alpha coefficient. A Cronbach's alpha coefficient greater than 0.7 was used to show internal inconsistency between the overall NQoL and its subscale scores.[12] Pearson correlation coefficients (r) were used to determine the strength of the relationship between each item and the scores. The absolute values of correlation coefficients were interpreted as 0.90 to 1.00, 0.70 to 0.90, 0.50 to 0.70, 0.30 to 0.50, and 0.00 to 0.30 as the following correlations: very high, high, moderate, low and negligible respectively.[13]

Univariate analysis by exact test for categorical variables and linear regression/median tests for continuous variables were used to explore the

existence of relationships between each question and urinating at night (frequency of urination, first urination time, urinary incontinence) and patient characteristics (gender, having at least one chronic disease, and prostatic hyperplasia or prostate cancer). Multivariate linear regression with backward selection was carried out using univariate variables that had a $p < 0.10$ to explore the significant variables for each question and a NQoL overall score. $p < 0.05$ were considered as statistically significant unless otherwise specified.

Results

Respondent characteristics

The estimated size necessary for this study is 370 calculated from the prevalence of nocturia patients from the menopause clinic mentioned earlier. One hundred and sixty-seven volunteers with a diagnosis of nocturia signed the consent form and were included in analysis. Twelve volunteers were excluded because they did not respond to any questions on the questionnaires. Therefore, 155 respondents were included in the analysis. The majority of the questionnaire respondents were male (80.65%) and at least 1 had an underlying disease requiring long-term follow-up by a physician (86.45%). The median urination at night was 3 time per night and the median first urination after retiring to bed was 3 hours. A summary of patient characteristics are shown in Table 1.

Reliability

Cronbach's alpha coefficient for the N-QOL (Q1-Q12) and two subscale scores showed good reliability for internal consistency (greater than 0.7) and overall NQoL and sleep/energy and bother/concern subscale scores, (0.884, 0.797, and 0.857 respectively). The correlation coefficients between overall NQoL and two subscale scores for sleep/energy showed a high correlation for sleep/energy and bother/concern subscale scores (r: 0.894 and 0.931 respectively). Supplementary Table 16 shows the correlation coefficient between each item and each total score)

Impact of nocturia on quality of life (QoL)

(Responses to the study questionnaire are summarized in Table 2.)

Table 1. Patient characteristics (N=155).

Variable	n (%)
Male gender	125 (80.65)
At least one chronic underlying disease	134 (86.45)
Benign prostatic hyperplasia or prostate cancer	65 (41.94)
Urination at night	
Mean n (SD)	2.99 ±1.39
Median n (IQR)	3 (2, 4)
Average frequency of urination per night	
1	21 (13.55)
2	36 (23.23)
3	50 (32.26)
4	30 (19.35)
5 or more	18 (11.61)
Urinary incontinence	20 (12.90)
The first urination after bed (n=153)[a]	
Mean (SD)	178.43± 97.62
Median (IQR)	180 (120, 240)
Min-Max	0, 10
First urination after bed (n=153) a	
Within 1 hr	20 (13.07)
More than 1 hour but within 2 hours	41 (26.80)
More than 2 hours but within 3 hours	42 (27.45)
More than 3 hours but within 4 hours	30 (19.61)
More than 4 hours but within 5 hours	9 (5.88)
More than 6 hours	11 (7.19)

[a]Two volunteers did not answer the question.

Table 2. Response to the study questionnaire

Question	Answer (score given)	n (%)	Median (IQR)	Correlation coefficient between row/column variables				
				Overall QoL(Q13)	NQoL overall score	Total Q1-11	Subscale scores	
							Sleep/ energy	Bother/ concern
Q1: Has made it difficult for me to concentrate the next day	every day (4) most day (3) some days (2) rarely (1) never (0)	4 (2.63) 7 (4.61) 20 (13.16) 36 (23.68) 85 (55.92)	0 (0, 1)					
Q2: Has made me feel generally low in energy the next day	every day (4) most day (3) some days (2) rarely (1) never (0)	3 (1.96) 4 (2.61) 43 (28.10) 34 (22.22) 69 (45.10)	1 (0, 2)					
Q3: Has required me to nap during the day	every day (4) most day (3) some days (2) rarely (1) never (0)	21 (13.64) 17 (11.04) 48 (31.17) 25 (16.23) 43 (27.92)	2 (0, 2)					
Q4: Has made me less productive the next day	Every day (4) Most day (3) Some days (2) Rarely (1) Never (0)	2 (1.30) 3 (1.95) 18 (11.69) 50 (32.47) 81 (52.60)	0 (0, 1)					
Q5: Has caused me to participate less in activities I enjoy	Extremely (4) Quite a bit (3) Moderately (2) a Little bit (1) Not at all (0)	2 (1.32) 4 (2.63) 11 (7.24) 56 (36.84) 79 (51.97)	0 (0, 1)					
Q6: Has caused me to be careful about when or how much I drink	All the time (4) Most of the time (3) Some of the time (2) Rarely (1) Never (0)	1 (0.67) 2 (1.33) 8 (5.33) 9 (6.00) 130 (86.67)	0 (0, 0)					
Q7: Has made it difficult for me to get enough sleep at night	Every night (4) Most nights (3) Some nights (2) Rarely (1) Never (0)	1 (0.67) 2 (1.33) 8 (5.33) 9 (6.00) 130 (86.67)	0 (0, 2)					

Table 2. Response to the study questionnaire

Question	Answer (score given)	n (%)	Median (IQR)	Correlation coefficient between row/column variables				
				Overall QoL(Q13)	NQoL overall score	Total Q1-11	Subscale scores	
							Sleep/ energy	Bother/ concern
Q8: Concerned that I am disturbing others in the house because of having to get up at night to urinate	Extremely (4) Quite a bit (3) Moderately (2) A little bit (1) Not at all (0)	3 (1.96) 5 (3.27) 6 (3.92) 37 (24.18) 102 (66.67)	0 (0, 1)					
Q9: Preoccupied about having to get up at night to urinate.	All the time (4) Most of the time (3) Some of the time (2) Rarely (1) Never (0)	3 (1.94) 12 (7.74) 17 (10.97) 43 (27.74) 80 (51.61)	0 (0, 1)					
Q10: Worried that this condition will get worse in the future	Extremely (4) Quite a bit (3) Moderately (2) A little bit (1) Not at all (0)	5 (3.23) 15 (9.68) 18 (11.61) 51 (32.90) 66 (42.58)	0 (0, 1)					
Q11: Worried that there is no effective treatment for this condition (having to get up at night to urinate)	Extremely (4) Quite a bit (3) Moderately (2) A little bit (1) Not at all (0)	5 (3.23) 9 (5.81) 15 (9.68) 44 (28.39) 82 (52.90)	0 (0, 1)					
Q12: Overall, how inconvenient having to get up at night to urinate has been during the past two weeks?	Extremely (4) Quite a bit (3) Moderately (2) A little bit (1) Not at all (0) very well (0)	6 (3.92) 11 (7.19) 18 (11.76) 72 (47.06) 46 (30.07) 7 (4.58)	0 (0, 1) 2 (1,2)	NA				
Q13: Overall, how is your overall quality of life?	Well (1) Moderately well (2) Fair (3) Poor (4)	61 (39.87) 76 (49.67) 8 (5.23) 1 (0.65)						
NQoL overall score Q1-Q12a	Min, Max: 0, 44	9.99±7.72	9 (4, 14)	0.452	NA			
Total score of Q1-11a		8.93 ±7.05	8 (4, 12)	0.445	0.995	NA		
Subscale scores for Sleep/Energya		5.70± 4.19	6 (2, 9)	0.416	0.894	0.910	NA	
Subscale scores for Bother/Concerna		5.52±5.08	4 (1, 8)	0.423	0.931	0.913	0.684	NA

[a]143 patients who completed all 13 questions were included in analysis

1. Concentration the next day

Around half of the patients answered that getting up at night to urinate had never made it difficult to concentrate (55.92%). An impact of nocturia on concentration the next day on some days was reported by approximately a quarter of the patients (23.68%). Only 4 of the patients (2.63%) reported that the nocturia had impact on their concentration every day. There was no significant relationship between the frequency of urination per night, urinary incontinence, or the first urination after retiring to bed or patient characteristics and the level of impact on concentration the next day.

2. Low in energy the following day

The response from nearly half (45.10%) the patients with nocturia was that nocturia had never made them feel generally low in energy the next day around a quarter of the patients reported that having to get up at night to urinate rarely had any impact (22.22%) on energy levels and on some days (28.10%). Only 2% of patients reported that nocturia made them low energy every day. The univariate analysis showed a statistically significant relationship between low energy levels the next day and the frequency of urination per night ($p < 0.001$), urinary incontinence at night ($p = 0.045$), and the first urination within 2 hours of retiring ($p = 0.001$). The multivariate analysis found that higher frequency of urination per night (multivariate $p = 0.004$, β Coefficient 0.183) and first urination within 2 hours of retiring (multivariate $p = 0.036$, β coefficient 0.501) were significant parameters in relation to greater impact on low energy the next day.

3. Sleep during the day

Nearly one third of patients (31.17%) required a nap during the day on some days due to nocturia, followed numerically by never required, rarely required, required every day and most days, respectively. Increasing frequency of urination per night has a significant relationship to a greater napping requirement according to both the univariate and multivariate analysis (multivariate $p = 0.001$, β coefficient 0.267). However, there was no relationship between urinary incontinence at night, the time to first urination of retiring and patient characteristics.

4. Productiveness

Approximately half patients (52.60%) answered that nocturia had never made them less productive the next day, followed by rarely (32.47%) and some days (11.69%). A few patients reported that nocturia impacted on productiveness every day (1.30%) or most days (1.95%). Both the univariate and multivariate analysis showed that earlier first urination after retirement was the only significant parameter predicting a level of impact on productiveness the next day (multivariate $p = 0.030$ and β coefficient -0.015). It was found that one third (33.33%) of the patients reporting a first urination within 2 hours of retiring reported that the nocturia had never had any impact on their productiveness the next day while just over half of patients (56.25%) reporting first urination within 2 hours of retiring or later answered that the nocturia had never impacted on their productiveness the next day.

5. Physical activities

Around half of patients (51.97%) reported that the nocturia had never caused them to participate less in activities they enjoy, followed by a small impact (36.84%). Less than 10% of patients reported that nocturia had caused them to participate less in activities they enjoy moderately (7.24%), quite a bit (2.63%), and extremely (1.32%). There was no significant relationship found between frequency of urination per night, urinary incontinence, or the first urination after retiring for the night or patient characteristics and levels of participation in activities they enjoy the following day.

6. Fluid restriction

Most of the patients (86.67%) reported that the nocturia had never caused them to be careful about when or how much they drank. Very few patients reported that nocturia caused them to restrict fluid intake some of the time (5.33%) or most of the time (1.33%). There was no significant relationship found between frequency of urination per night, urinary incontinence, or the first urination after retiring to bed or the patient characteristics and impact on level of fluid restriction.

7. Inadequate sleep at night

Most of the patients (86.67%) reported that the nocturia had never resulted in insufficient

sleep. Very few patients reported that nocturia caused them to have inadequate sleep at night some of the time (5.33%) or most of the time (1.33%). The univariate analysis showed that a statistically significant relationship exists between the frequency of urination per night ($p < 0.001$), urinary incontinence at night ($p = 0.007$), and the first urination within 2 hours of retiring ($p = 0.003$) and sleep disturbance. The multivariate analysis found that a higher frequency of urination per night (multivariate $p < 0.001$, β Coefficient 0.272) was a significant parameter in related to more impact on inadequate sleep at night.

8. Disturbance of others

Two thirds of the nocturia patients (66.67%) answered that nocturia had never caused disturbance to others. Around a quarter of the patients reported that having to get up at night to urinate caused little disturbance to others (24.18%). Only 2% of patients reported that nocturia had caused extreme disturbance to others. The univariate analysis showed a statistically significant relationship exists between frequency of urination per night ($p = 0.006$), urinary incontinence at night ($p = 0.042$), and the first urination within 2 hours of retiring ($p = 0.027$) and disturbance of others. The multivariate analysis found that urinary incontinence (multivariate $p = 0.034$, β Coefficient 0.453) and first urination within 2 hours of retiring (multivariate $p = 0.009$, β coefficient 0.509) was a significant parameter in relation to more impact on the disturbance of others.

9. Worrying about the effective treatment

Approximately half patients (52.90%) answered that nocturia had never made them worry about the efficacy of treatment, followed by a little bit (28.39%) and moderately (9.68%). Less than 10% of patients reported that nocturia had caused them to worry about the efficacy of treatment quite a bit (5.81%), and extremely (3.23%). The univariate analysis showed that a statistically significant relationship exists between the frequency of urination per night ($p < 0.001$), urinary incontinence at night ($p = 0.005$), and the first urination within 2 hours of retiring ($p = 0.002$) and level of worrying over treatment options. The multivariate analysis found that higher frequency of urination per night (multivariate $p = 0.004$, β coefficient 0.135), urinary incontinence (multivariate $p = 0.016$, β coefficient 0.590) and first urination within 2 hours of retiring (multivariate $p = 0.027$, β coefficient 0.541) was a significant parameter related to a greater impact of worrying about effective treatment.

10. Inconvenience of getting up at night to urinate

Around half of the nocturia patients (47.06%) experience a minor level of inconvenience due to nocturia, followed by never inconvenient (30.07%). About 10% of patients reported that nocturia had inconvenienced them, quite a bit (7.19%), and extremely (3.92%). The univariate analysis showed a statistically significant relationship exists between frequency of urination per night ($p < 0.001$), and urinary incontinence ($p = 0.001$) and overall inconvenience. The multivariate analysis found that higher frequency of urination per night (multivariate $p = 0.001$, β Coefficient 0.188) and urinary incontinence (multivariate $p < 0.001$, β coefficient 0.891) were significant as regards relationship to greater inconvenience to get up from nocturia while there was no relationship between the first urination after retiring and the patient characteristics.

11. Overall quality of life (Q13)

Approximately half of the patients (49.67%) answered that despite the nocturia they had a moderately good quality of life, followed numerically by good (28.39%), fair (5.23), very good (4.58%). Only one patient (0.65%) reported that the nocturia impacted poorly on their quality of life. Increasing frequency of urination per night has a significant relationship with overall quality of life as shown by both the univariate and multivariate analysis (multivariate $p = 0.002$, β coefficient 0.120) while there was no relationship between having urinary incontinence at night, the time of first urination after bed and the patient characteristics.

12. N-QoL overall score and total score of Q1-Q11

One hundred and forty-three patients who completed all 13 questions were included in the analysis. Mean N-QoL overall score (Q1-Q12) was 9.99, with an SD of 7.72., and the highest score was 44. Mean N-QoL overall score was 9.99, with an SD of 7.72., and the highest score was 44.

Table 3. Linear relationship between NQoL overall scores (Q1-Q12)/total scores of Q1-Q11 and overall QoL (Q13).

Variable	n	NQoL score (%)					Univariate linear regression p-value	Beta Coef.
		Very poor (4)	Poor (3)	Fair (2)	Good (1)	Very good (0)		
NQoL overall score	143						< 0.001	0.041
Mean (SD)		44	16.85 (8.89)	11.35 (7.17)	7.68 (6.07)	2.86 (2.85)		
Median (IQR)		44 (44, 44)	17 (5, 26)	10.5 (6, 16)	7 (3 ,10)	2 (0, 6)		
Total score of Q1-11	143						< 0.001	0.044
Mean (SD)		40	14.86 (7.82)	10.13 (6.51)	6.98 (5.66)	2 (2.77)		
Median (IQR)		40 (40, 40)	16 (4, 22)	9.5 (5, 14.5)	7 (2.5, 9)	0 (0, 4)		

Alike total score of Q1-11, mean total score of Q1-11 was 8.93, with an SD of 7.05. Univariate liner regression found that NQoL overall score (univariate linear regression $p < 0.001$, β coefficient 0.041) and total score of Q1-11 ((univariate linear regression $p < 0.001$, β coefficient 0.044) showed that a significant linear relationship exists between NQoL overall score (Q1-Q12)/ total scores of Q1-11 and overall QoL (Q13). The linear relationships between NQoL overall scores (Q1-Q12)/total scores of Q1-Q11 and overall QoL (Q13) are shown in Table 3.

Increasing frequency of urination per night has a significant relationship with the NQOL overall score (Q1-Q12) including total score of Q1-11) in both the univariate and multivariate analysis (Multivariate $p = 0.002$, β coefficient 1.54 and 1.527, respectively). The univariate analysis shows a statistically significant relationship exists between the first urination within 2 hours of retiring ($p = 0.002$) and the NQoL overall score (Q1-Q12) including total score of Q1-11. There was no significant relationship found between urinary incontinence or patient characteristics and the NQoL overall score (Q1-Q12) including total score from Q1-11.

Discussion

Nocturia is defined as the need to void ≥1 time during the sleeping period of the night. Clinically relevant nocturia (≥ 2 voids per night) affects 28-62% for those aged 70-80 years.[14] Choi et al. found that sleep quality mediated the association between nocturia and health-related quality of life (HRQOL).[15]

Nocturia is associated with multiple comorbidities.[16] Increased nocturia severity is related to decreased quality of life, higher age, urinary tract symptom scores, nocturnal urine volume, evening fluid consumption and beta-blocker medication rates. Furthermore, increased nocturia severity has also been found to be associated with higher nocturnal polyuria, global polyuria and reduced bladder capacity rates.[17] Worryingly, Pesonen et al. found that nocturia is potentially associated with an approximately 1.3-fold increased risk of death.[18]

Torimoto et al. reported nocturia has close relationships with the first uninterrupted sleep period (FUSP) and the number of wake-ups and can result in decreased daytime quality of life in young Japanese people.[19] Zeng et al. reported that nocturia patients presented as having a significantly reduced quality of life, reduced work productivity and increased utilization of healthcare resources when compared with OAB and/or BPH.[20]

Theerawirojana et al. reported a correlation between bladder capacity and lower urinary tract symptoms after renal transplantation and concluded that nocturia and nocturnal polyuria are characteristics of lower urinary tract function after renal transplantation, and are probably associated with long term anuria during hemodialysis and small bladder capacity. Quality of life was not impacted by lower urinary tract symptoms evidenced by a low symptom score for most patients.[21]

From our study, most patients had moderate to good quality of life with some inconvenience from nocturia, and the impact required them to nap during the day on some days. Increasing frequency of urination per nights was significantly related to low energy levels the next day, greater napping requirements during the day, inadequate sleep at night, worry over treatment options, overall inconvenience, and overall quality of life as shown by the NQoL overall score (Q1-Q12)

and total score of Q1-11.

Our analysis shows a statistically significant relationship exists between urinary incontinence and disturbance of others, preoccupation with waking at night, and worry over the condition worsening. Furthermore, we also found that a time to first urination after bed of less than 2 hours was significantly related to low energy levels and lower productivity the next day, disturbing others in the house, and worry that there is no effective treatment for nocturia. These were significantly related to NQoL overall score (Q1-Q12) and total score of Q1-11.

On the other hand, there was no significant relationship found between the frequency of urination per night, urinary incontinence, the first urination after retiring for the night, patient characteristics, fluid restriction, levels of concentration or participation in activities they enjoy the next day.

Our study demonstrated that nocturia patients report a significant reduction in quality of life, and decreased sleep quality. Nocturia was reported as negatively affecting patient concentration and activity, and there is clear impact on the reduction in energy levels necessitating a greater need for napping during the day from sleep deprivation and worry about treatment options including overall quality of life.

Conclusion

We found that nocturia patients experienced a significant reduction as regards quality of life and a decrease in sleep quality due to their nocturia. To improve the overall quality of life of these patients, clinicians need to focus on reducing the frequency of nighttime urination and delaying the time of first urination after retiring to bed.

Conflict of Interest

The authors declare no conflict of interest.

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