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Sleep disturbances and sexual function among men aged 45–75 years in an urban area of IranSakineh Mohammadalizadeh Charandabi^a, Nazanin Rezaei^{b,*}, Sevil Hakimi^a, Shiva Khatami^c, Reza valizadeh^d, Arman Azadi^e^aDepartment of Midwifery, Faculty of Nursing and Midwifery, Tabriz University of Medical Sciences, Tabriz, Iran^bDepartment of Midwifery, Faculty of Nursing and Midwifery, Ilam University of Medical sciences, Ilam, Iran^cEducation and Human Resource Studies with Emphasis on Organizational Learning, Performance and Change, School of Education, Colorado State University, USA^dPsychiatry Department, School of Medicine, Ilam University of Medical sciences, Ilam, Iran^eDepartment of Nursing, Faculty of Nursing and Midwifery, Ilam University of Medical sciences, Ilam, Iran

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ABSTRACT

Background and aims: Aging in men is associated with various physical and mental symptoms, including sleep problems and sexual dysfunction. The aim of this study was to determine the status of sleep disorders and sexual dysfunction in men aged 45–75 years in Ilam, Iran.

Materials and methods: In this population-based cross-sectional study, 390 men aged 45–75 years were selected by cluster randomization in Ilam–Iran. Data were collected using 0–100 brief sexual function inventory and the sleep disorder questionnaires.

Results: Totally, 34.6% of men complained about sleep disorders: 17.4% about falling asleep, 12.8% about frequent nocturnal awakenings, 12.8% about waking up in the early hours in the morning and problem in falling asleep again, and 24.9% about fatigue and tiredness despite getting enough sleep. There was a significant relationship between all aspects of sexual function and the common problems related to sleep ($p < 0.001$). The older, unemployed, illiterate men, those with inadequate income, those affected by chronic diseases, and/or urinary incontinence had significantly inferior sexual function compared with the others.

Conclusion: According to the high prevalence of sleep disorders in men as well as its association with sexual dysfunction, adopting health measures in this regard is necessary.

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1. Introduction

Increase in life expectancy in the recent decades has resulted in the increase in the population of the middle-aged and the elderly men. As they get older, men experience some changes in their physical and mental status due to decrease in androgen; changes like sleep disorders and sexual dysfunction [1,2]. Sleep, constituting one third of the people's whole lifetime, has a significant role in the rate of testosterone secretion, studies show that the maximum testosterone secretion rate occurs during sleep mainly rapid eye movement (REM). So, having adequate and high quality sleep is important for having satisfiable erection [3].

Sleep disorder is one of the problems that appears or intensifies with age. As people get older, the advantageous and desirable sleep decreases in them and this matter is associated with decrease in the rate of testosterone and its complications like a decrease in sexual function. The rate of testosterone in half of the healthy men aged 50-70 years is less than that in those aged 20-40 years [2].

Some people get involved with the middle age crisis as a result of the changes due to the decrease of androgen, the symptoms of which usually appear in middle age period and afterward. This crisis appears with sudden and obvious changes like severe depression, increase in taking some drugs, change in lifestyle, changes in working and matrimony relations, and some disorders related to sexual function [4].

Some sources engaged in stating the relationship between the incidence of sleep disorders, and fatigue and tiredness despite getting enough sleep, and also the relationship between sleep disorders and hypo-gonadotropism and eventually decrease in free testosterone and the consequent decrease in sexual function and its related complications [2,5,6].

The results of the studies show that people who have trouble in sleeping for any reason and those who do not feel satisfied with their nightly sleep resulted from various chronic diseases such as apnea, have inferior sexual function compared to others [1,7]. However, there is not a consensus among researchers in this relation [8].

Despite considerable decrease in the mean hours of the normal sleep in recent years due to various reasons [9,10], especially in old ages [11,12], the results of the studies on the relationship between sleep disorders and sexual function are contradictory [8,13,14]. Hitherto no study has been conducted in this relation in Iran on the middle-aged men. So, this study was performed aiming at determining the state of sleep disorders and sexual dysfunction and its relation with aging in the men aged 45-75 years in Ilam located in the west of Iran.

2. Methods

In this is cross-sectional study, 390 middle-aged and older men were studied from the late June to the late July 2011. After approval of Ethic Committee of Tabriz University of Medical Sciences, sampling was done through cluster randomization from Ilam-Iran. Given that this paper is a part of a

study in which the lifestyle of the wives are examined too, 80 women residing in Ilam, aged 45-54 years in the statistics of 2006, were selected randomly with the cooperation of Iran Statistic Center. The address of these people was considered to be the head in each cluster, sampling was started from the cluster head and continued from right side to the point that 5 eligible people were accessed. 400 people were selected to participate in the study. Finally, 10 men were excluded because of the inadequacy of the number of subjects in the age groups, and 390 people were selected as the sample. The sample size was calculated by considering the power 0.9, $\alpha=0.05$, $\sigma=22$ [15].

The exclusion criteria were those who had a surgery operation during the last three months; past record of suffering from chronic diseases except in heart; diabetes; hypertension; urinary incontinence; backache; and also the past record of taking a special drug except the drugs related to the aforementioned diseases; past record of hamocardiorrhagia or cerebral apoplexy, less than 6 months living with the present spouse; existence of any kind of sore or lump in genital tract; suffering from any mental disease and appearance of any sever stress like occurrence of an accident or losing one of the main body limbs during the last three months.

So, with respect to the exclusion criteria, 13 people were excluded from the study because of their unwillingness, and 25 people because of some problems like suffering from some diseases like dermal disease, birth defects, mental disorders, multiple sclerosis, advanced rheumatoid arthritis, hamocardiorrhagia or cerebral apoplexy (9 people), passing less than three months since surgery (3 people), bigamy (10 people), missing a family member (sister, brother, father, mother, child) during the last three months (3 people). These people were replaced by the next person in their cluster.

The data were collected by a trained interviewer man through the interview. Going to their doors and ensuring that they had the criteria of the study, the interviewer completed the questionnaires. The subjects were assured that the gathered information would be confidential and that they could leave the study if they intend to. Written consent was obtained from all the samples. If the samples were not home at the two repetitive times of the interrogator's coming to their house, at the time that the subject was likely to be home, the next questionnaire would be completed. The questionnaires were anonymous and included demographic information and the questionnaire related to the assessment of sexual function of men (Brief sexualfunction inventory) and the questionnaire related to the evaluation of sleep disorders [16]. The demographic information questionnaire would examine some variables, including age, level of literacy, employment status, and income status, being affected by chronic heart diseases, hypertension, diabetes, and past record of prostate surgery.

To use the questionnaire, firstly, permission was obtained by the TRUST Organization Then, it was translated into Persian and re-translated by two people who were proficient in both English and Persian. After that, the translators met the members of the research team and examined the differences between the re-translation and the original questionnaire. Finally, the experts confirmed that the Persian copy

and the English one are equivalents. This questionnaire assesses men's sexual function in 5 aspects including sexual desire (2 questions), erection (3 questions), ejaculation (2 questions), problem assessment (3 questions), and total satisfaction (1 question). The questions are in the form of Likert five-option, and based on the answers of the participants each question is scored from 0-4. Then, the mean score related to each of the 5 aspects above was calculated, and the score in each section was equal to the sum of the scores of subsets of that part. Finally, the sum of the scores in each aspect was equal to the sum of the obtained scores. In case the question was not answered, the mean of the sum of its scores was used. The subjects' score in each aspect was calculated from the range between 0 and 100, and higher scores would represent better sexual performance.

The questionnaire of examining sleep disorders was designed by the authors based on the national guideline of training manual for the integrated care for the old and the middle-aged [17]. This questionnaire generally examines four types of sleep related disorders, including: problem in falling asleep, frequent nocturnal awakening, waking up in the early hours in the morning, and fatigue and tiredness despite getting enough sleep.

The validity was tested through face validity and content validity. For this purpose, the questionnaire was given to 12 members of the faculty of Tabriz University of Medical Sciences of in the departments of Midwifery, Psychology, and Urology, and their comments and modifications were applied.

To test the reliability of the questionnaire, in a pilot study, the final copy of the questionnaires was given to 30 people qualified to participate in this study. The reliability of the questionnaires turned out to be desirable using test-retest ($ICC > 0.75$ for all items). Also, the Cronbach's alpha coefficient was used; the internal consistency was obtained to be 0.86 and 0.77 for sexual function and sleep disorder questionnaires respectively. The data were analyzed using SPSS-version 18. Since sexual function score did not have a normal distribution, non-parametric tests were used to analyze them. Kruskal Wallis was used to assess the relationship between the scores and the kind of sleep disorder and Mann Whitney test was applied to compare the mean rank of the different aspects of sexual function based on the demographic characteristics.

3. Results

The mean age of the men was 60.6 (SD 5.4); about one third (31%) of them were illiterate and only 42 people (10%) had academic degree. 319 (82%) were employed and more than half of them (61%) evaluated their income as inadequate. About one third of the men (34%) suffered from chronic heart diseases, hypertension and/or diabetes and 7 (1.8%) reported to have urinary incontinence.

Totally, sleep-related problems were reported by 34.6% of the men (some participants reported more than one sleep related problem). The most frequent sleep problem reported by the participants was fatigue and tiredness despite getting enough sleep (Table 1).

Table 1 – Frequency of sleep disorders in men 45–75 years of Ilam.

Sleep disorder	Number	Percent
Without sleep disorder	237	60.8
Difficulty falling asleep	68	17.4
Waking up frequently	50	12.8
Waking in the early hours of the morning and being unable to fall asleep again	50	12.8
Feeling tired and boring despite enough sleep	97	24.9

The highest score of sexual function among those who had no complain of sleep problems was related to ejaculation aspects and the lowest score was related to sexual desire.

Also, the lowest score obtained among those with any kind of sleep problems was related to sexual desire (Table 2).

There was a significant relationship between all aspects of sexual function and the prevalent problems related to sleep ($p < 0.001$). The mean score in all aspects of sexual function was significantly lower in the men with sleep disorders than that in those without sleep problems ($p < 0.001$).

There was also a significant relationship between all aspects of sexual function and some demographic characteristics like age, education level, chronic diseases, household income, and employment status; the older men, illiterate ones, those affected by chronic diseases, those with inadequate income, unemployed ones, and those who suffered from urinary incontinence had an inferior sexual function compared with the others ($p < 0.05$) (Table 3).

4. Discussion

This study aimed to investigate the relationship between sleep disorders and Iranian men's sexual function and its relationship with aging. The results of the present study showed that totally 34.6% of the men complained of sleep related disorders. Moreover, there was a significant relationship between sleep disorders and all the aspects of sexual function.

The study conducted by Jankowski et al. aiming at examining the relationship between sexual disorders and sleep related disorders showed that there was a relationship between sleep disorders and decrease in sexual function [18], which is in line with the results of the present study.

Many researchers believe that the people who do not have adequate sleep face any problems like inadequate erection for sexual relation [3,19]; in fact recovering sexual function after treating sleep problems can confirm this claim [13].

Nonetheless, the results of a study by Schiavi et al. investigating the relationship between sleep disorders and sexual function on 70 married men aged from 45 to 75 in America showed that there is not a significant relationship between sleep disorders and the decrease in sexual function [8]. It seems that the reason for this difference is taking sedative drugs to relieve sleep disorders [20] or the impressibility of sexual function by the culture and the demographic specifications of different societies.

Table 2 – Mean (SD) and mean rank of sexual function in men 75–45 years by the sleep disorder groups in Ilam.

Sleep disorder groups	Number	Sexual desire		Erection		Ejaculation		Overall satisfaction		Problem assessment	
		M (SD)	MR	M (SD)	MR	M (SD)	MR	M (SD)	MR	M (SD)	MR
0	237	46.7 (21.3)	226.6	73.2 (32.3)	221.5	86.0 (32.3)	215.4	71.2 (30.6)	221.0	75.3 (30.9)	222.7
1	18	29.9 (25.1)	147.0	54.2 (43.5)	174.2	61.8 (46.7)	157.4	51.4 (41.5)	169.4	54.6 (45.1)	180.1
2	35	29.6 (25.1)	141.3	49.7 (38.5)	150.9	63.9 (45.6)	164.9	43.5 (32.8)	127.2	47.6 (36.1)	128.7
3	100	31.0 (23.1)	149.3	51.0 (37.7)	153.3	65.7 (44.1)	165.9	52.0 (37.7)	163.7	47.6 (38.1)	157.2
p-Value		0.000		0.000		0.000		0.000		0.000	

Abbreviations: M (SD), Mean (standard deviation); MR (Mean Rank)

Score range in all sexual function domains: 0–100; the higher score, the better function

0 Without sleep disorder, 1 Difficulty falling asleep, 2 Feeling tired and boring despite enough sleep, 3 Other.

Table 3 – Mean (SD) and mean rank of sexual function based on the demographic characteristics.

Demographic Characteristics	n	Sexual desire	Erection	Ejaculation	Overall satisfaction	Problem assessment
Age (Years)						
45–59	157	44.7 (23.3)* 217.6†	69.6 (33.7)* 209.9†	82.9 (35.4)* 209.2†	69.4 (32.8)* 217.2†	73.2 (33.8)* 221.2†
60–75	233	37.4 (23.1)* 180.6†	61.9 (37.7)* 185.8†	74.2 (40.8)* 186.3†	58.4 (35.6)* 180.9†	61.2 (36.8)* 178.2†
p-Value		0.001	0.035	0.016	0.001	0.000
Education level						
Literate	269	43.2 (22.2)* 208.27†	69.4 (34.8)* 210.9†	82.0 (36.2)* 206.91†	67.4 (33.4)* 210.7†	71.0 (34.6)* 213.74†
Illiterate	121	34.1 (24.7)* 167.1†	53.7 (37.7)* 161.4†	68.3 (43.0)* 170.1†	52.7 (35.9)* 161.7†	55.1 (37.0)* 155.0†
p-Value		0.001	0.000	0.000	0.000	0.000
Chronic Diseases						
YES	132	35.8 (21.9)* 170.8†	57.1 (35.9)* 167.0†	73.2 (40.9)* 184.2†	56.4 (35.6)* 173.5†	58.3 (36.3)* 165.3†
NO	258	42.7 (23.8)* 208.1†	68.54 (36.2)* 210.1†	80.1 (36.7)* 201.3†	66.1 (34.1)* 206.7†	70.1 (35.4)* 211.0†
p-Value		0.001	0.000	0.085	0.004	0.000
Household income						
adequate	154	46.3 (20.3)* 222.8†	73.8 (32.0)* 223.8†	87.1 (31.5)* 219.4†	72.6 (30.8)* 227.2†	73.4 (30.8)* 218.3†
Inadequate	236	36.5 (24.5)* 177.7†	58.5 (37.9)* 177.0†	71.6 (42.0)* 179.9†	56.5 (35.9)* 174.8†	60.7 (38.2)* 180.6†
p-Value		0.000	0.000	0.000	0.000	0.001
Occupational status						
Employed	319	42.2 (23.1)* 204.6†	66.4 (35.9)* 201.5†	79.5 (37.9)* 200.7†	64.8 (34.6)* 202.6†	68.0 (35.7)* 203.0†
Unemployed	71	32.0 (22.9)* 154.6†	56.1 (37.7)* 168.8†	69.5 (42.5)* 172.3†	53.9 (34.8)* 163.5†	57.3 (36.9)* 162.0†
p-Value		0.000	0.025	0.019	0.005	0.005
Urinary incontinence						
Yes	7	25.0 (25.0)* 128.5†	23.8 (23.9)* 71.9†	41.1 (42.5) 91.7†	28.5 (33.6) 99.2†	22.6 (30.8)* 77.8†
No	383	40.6 (23.3)* 196.7†	65.3 (36.3)* 197.8†	78.4 (38.6) 197.4†	63.4 (34.6) 197.3†	66.9 (35.7)* 197.7†
p-Value		0.101	0.003	0.003	0.017	0.005

Score range in all sexual function domains: 0–100; the higher score, the better function.

* Mean (SD).

† Mean Rank.

Some sources talk about the appearance of sleep disorders and fatigue and tiredness despite getting enough sleep associated with aging, and about the relationship between sleep disorders and decreased sexual function and its due

complications [5,6,21] which is consistent with the results of the present study.

Because of the reduction in leydig perfusion cells testis will have a problem, and response to sexual steroids decreases due

to the change in the level of LH and some other hormones [22,23], hence some sexual disorders are more likely to appear with ageing among which lack of sexual desire, orgasm, erectile dysfunction and physical inability to have sex after the age of 50 can be mentioned [24].

The results of this study showed a significant relationship between suffering from chronic diseases (diabetes, hypertension, and heart diseases) and reduction in sexual function, which is consistent with the obtained results of the study by Kim et al. In 2523 men aged from 40 to 69 in Korea [25].

In the present study, 12.8% of the samples reported frequent nocturnal awakenings which had a significant inverse relationship with all aspects of sexual function. Suffering from cardiovascular disorders like impaired vasodilatation [22], blood vessels atherosclerosis, and diabetes can be associated with reduction in sexual function due to the inverse relation that they have with the testosterone level [5].

On the other hand, the amplitude and frequency of erection occur in 20–25% of the time of nocturnal sleep cycles, and taking hypertension-lowering drugs can disrupt the sleep pattern (due to frequent waking at night to urinate), decrease sexual desire and frequency of sexual activity, and can result in erectile dysfunction as well [3].

Wessells et al. Revealed in a review study that the employed people and those with higher income have better sexual function compared to others [26]. In another study, researchers, using BSFI questionnaire, examined the sexual function of 3500 men aged from 20 to 79, and they found that all aspects of sexual function significantly are influenced by educational level.

Nevertheless, other factors being controlled, educational level had no decisive role in the change in sexual function [27]. Consistent with the results of the present study, the findings of the study by Tan et al. showed that literate people had better sexual function than illiterate ones [28].

The results of our study were also showed that the men with urinary incontinence had low scores in all aspects of sexual function (except in sexual desire), and this matter can represent the influence of urinary incontinence on sexual function despite having adequate sexual desire. The review study by McVary (2005) also showed that there is a strong correlation between urinary incontinence and the decreased sexual function in the aspects of sexual desire, erection, ejaculation, total satisfaction and problem assessment. This reduction was also significant without taking other factors into account [29].

It seems that frequent waking up to urinate and disrupting sleep cycles as a secondary factor, and being worried about involuntary excretion of urine during sex directly can cause sexual dysfunction in men.

According to the findings in this study and the high prevalence of sleep disorders in the Iranian 45–75 year old men and its relationship with sexual dysfunction, the results of this study have applications for health planners and health providers. Given that satisfying sexual relations and enjoying physical health are the two important factors of married life satisfaction for men [30], and due to the relationship existing between the report of sleep disorders and reduction in sexual function [8], and on the other hand, because of the relation between the report of sleep disorders and reduction in life

quality, particularly in middle-aged and older men [31,32], and also according to the significance of sexual function in men's life and its influence on their mental health [33], it seems necessary to plan for solving the aforementioned problems and improving the quality of life especially in deprived areas like Ilam the people of which do not have desirable access to training, health care and counseling centers for sleep and sexual problems.

Despite the strength of this study such as sutudy disgn and sampling method, it also has some limitations. First, our sample were recruited from a city in western of Iran which is not represent variation of all the country population. In relation to future research, replicating such studies in other Iranian regions are required. Next, Understanding other factors that affects sexual function of older people requires further studies.

Conflict of Interest statement

Authors declare that they have no conflict of interest.

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REFERENCES

- [1] Schiavi RC, White D, Mandeli J. Pituitary-gonadal function during sleep in healthy aging men. *Psychoneuroendocrinology* 1991;17(6):599–609.
- [2] Morales A, Heaton JPW, Carson CC. Andropose: a misnomer for a true clinical entity. *J. Urol.* 2000;163:705–12.
- [3] Kandeel FR, Koussa VT, Swerdloff RS. Male sexual function and its disorders: physiology, pathophysiology, clinical investigation, and treatment. *Endocr. Rev.* 2001;22(3):342–88.
- [4] Delhez M, Hansenne M, Legros J-J. Andropause and psychopathology: minor symptoms rather than pathological ones. *PNEC* 2003;28:863–74.
- [5] Wespes E, Schulman CC. Male andropause: myth, reality, and treatment. *Int. J. Impot. Res.* 2002;14(1):93–8.
- [6] Morley JE, Perry III HM, Kevorkian RT, Patrick P. Comparison of screening questionnaires for the diagnosis of hypogonadism. *Maturitas* 2006;53:424–9.
- [7] Jannini EA, Sternbach N, Limoncin E, Ciocca G, Gravina GL, Tripodi F, et al. Health-Related characteristics and unmet needs of men with erectile dysfunction: a survey in five European Countries. *J. Sex. Med.* 2014;11:40–50.
- [8] Schiavi RC, Mandeli J, chreiner-Enge PS, Chambers PA. Aging, sleep disorders, and male sexual function. *Biol. Psychiatry* 1991;30:24 15.
- [9] JinKwan K, KwangHo I, JeHyeong K, SeHwa Y, KyungHo K, JaeJeong S, et al. Prevalence of sleep-disordered breathing in middle-aged Korean men and women. *Am. J. Respir. Crit. Care Med.* 2004;170:1108–13.
- [10] Terry MP Y, Dempsey J, Skatrud J, Weber S, Badr S. The occurrence of sleep-disordered breathing among middle-aged adults. *NEJM* 1993:1230–6.

- [11] Ancoli-Israel S. Sleep and its disorders in aging populations. *Sleep Med.* 2009;10:S7-11.
- [12] Kripke D, Simons R, LGarfinkel, Hammond E. Short and long sleep and sleeping pills. Is increased mortality associated? *Arch. Gen. Psychiatry* 1979;36:103-16.
- [13] Pacchiarotti I, Manfredi G, Kotzalidis GD, Ruberto A, Tatarelli R, Girardi P. A case of social phobia and avoidant personality disorder with erectile dysfunction successfully treated with venlafaxine and add-on reboxetine, Department of Psychiatry, University of Rome; 2003.
- [14] Andersen ML, Tufik S. The effects of testosterone on sleep and sleep-disordered breathing in men: its bidirectional interaction with erectile function. *Sleep Med. Rev.* 2008;12:365-79.
- [15] Sayemiry K. Testing of hypotheses. *Biostatistics, applied research methodology*, vol. 1. Ilam: Guyesh; 2005. p. 119.
- [16] Mapi Research Trust Education Information Dissemination. O'Leary M. Moleary1@partners.org. Brief sexual function inventory (BSFI); 2004.
- [17] Khoshbin S, et al. Psychopathy. *Integrated geriatric care training manual*, Tehran: Tandis-Ministry of Health and Medical Education, Department of Health, Office of Elderly Health; 2008. p. 65-8.
- [18] Jankowski JT, Seftel JAD, Strohl KP. Erectile dysfunction and sleep related disorders. *J. Urol.* 2008;179:837-41.
- [19] Guilleminault C, Eldridge F, Tilkian A, Simmons F, Dement W. Sleep apnea syndrome due to upper airway obstruction. A review of 25 cases. *Arch. Intern Med.* 1977;137:296-300.
- [20] Martin-Morales A, Sanchez-Cruz JJ, Tejada ISD, Rodriguez-Vela L, Jimenez-Cruz JF, Burgos-Rodriguez R. Prevalence and independent risk factors for erectile dysfunction in Spain: results of the epidemiologia de la disfuncion erectil masculina study. *J. Urol.* 1999;166:569-75.
- [21] Morales A, Heaton JPW, Carson CC. Andropause: a misnomer for a true clinical entity. *J. Urol.* 2000;163:705-12.
- [22] Verma P, Mahajan K, Mittal S. Andropause – a debatable physiological process. *JK Sci.* 2006;8(2):68-71.
- [23] Lunenfeld B, Gooren L. *Men health*. Boca Raton: A CRC Press COMPANY; 2001.
- [24] Bacon CG, Mittleman MA, Kawachi I, Giovannucci E, Glasser DB, Rimm EB. Sexual function in men older than 50 years of age: results from the health professional follow-up study. *Ann. Intern. Med.* 2003;139:161-8.
- [25] Kim J, In K, Kim J, You S, Kang K, Shim J, et al. Prevalence of sleep-disordered breathing in middle-aged Korean men and women. *Am. J. Respir. Crit. Care Med.* 2001;170:1108-13.
- [26] Wessells H, Joyce GF, Ise MW, Wilt TJ. Erectile dysfunction. *J. Urol.* 2007;177:1675-81.
- [27] Mykletun A, ADahl A, O'Leary MP, Fossa SD. Assessment of male sexual function by the brief sexual function inventory. *BJU Int.* 2005;97:316-23.
- [28] Tan JK, Hong CY, Png DJC, Liew LC, Wong ML. Erectile dysfunction in Singapore: prevalence and its associated factors—a population-based study. *Singap. Med. J.* 2003;44(1):20-6 44.
- [29] McVary KT. Erectile dysfunction and lower urinary tract symptoms secondary to BPH. *Eur. Urol.* 2005;47:838-45.
- [30] Heiman JR, Long JS, Smith SN, Fisher WA, Sand MS, Rosen RC. Sexual satisfaction and relationship happiness in midlife and older couples in five countries. *Arch. Sex. Behav.* 2011;40:741-53.
- [31] Low WY, Tong SF, Tan HM. Erectile dysfunction, premature ejaculation and men's quality of life: an Asian perspective. *J. Men's Health* 2008;5(4):282-8.
- [32] Chao J-K, Lin Y-C, Ma M-C, Lai C-J, Ku Y-C, Kuo W-H, et al. Relationship among sexual desire, sexual satisfaction, and quality of life in middle-aged and older adults. *J. Sex Marital Ther.* 2011;37:386-403.
- [33] Nicolosi A, Laumann EO, Glasser DB, Moreira ED, Paik A, Gingell C. Sexual behavior and sexual dysfunction after age 40: the global study of sexual attitudes and behaviors. *ADULT Urol.* 2004;64:991-7.