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Association of Quality of Life and Sleep Quality in Patients with Ischemic Stroke

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Abstract

Objective: To investigate functional status, anxiodepressive profile, Sleep Quality (SQ) and Quality of Life (QOL) and to determine predictive factors of poor QOL in persons with Ischemic Stroke (ISP).

Methods: A cross sectional descriptive study (January-August 2017) including a sample of 50 ISP was conducted. The Medical Outcomes Study 12-Item Short-Form Health Survey (SF12) was used for QOL evaluation. SQ was evaluated according to the Pittsburgh Sleep Quality Index (PSQI) and the Epworth Sleepiness Score (EpSS). The anxio-depressive profile was assessed according to the Hospital Anxiety and Depression scale (HAD).

Results: Both physical and mental QOL were altered in the study sample. The prevalence of poor physical QOL and poor mental QOL was 98% and 82% respectively. There was no correlation between functional status and QOL. Concerning SQ, the PSQI was correlated with both physical (r= -0.367; p=0.009) and mental QOL (r= -0.364; p=0.009). Physical QOL was also correlated with the EpSS (r= -0.329; p=0.02). The greater sleep scores were the worse QOL would be. Mental QOL was correlated with anxiety (r= -0.638; p<0.001) and with depression (r=-0.562; p<0.001). The more anxious or depressive ISP were, the worse mental QOL they would have. Predictive factors of poor physical QOL were: ischemic stroke duration>1.75 years (OR=4; p=0.033) and EpSS>8 (OR=5; p=0.015). Predictive factors of poor mental QOL were HAD-Anxiety>7.5 (OR=17.3; p<0.001) and HAD-Depression>7.5 (OR=6.2; p=0.022).

Discussion-Conclusion: In addition to physical and mental impairment resulting from stroke itself, the presence of Sleep Disorders (SD) impact negatively QOL in ISP. Furthermore, the potential impact of psychological disorders on QOL, may affect patient involvement in his rehabilitation program. Thus, diagnosing and treating SD and psychologic disorders are of a major importance in ISP to optimize their functional outcome and improve their QOL.

Abbreviations

ADL	:	Activities of Daily Living
BI	:	Barthel Index
EpSS	:	Epworth Sleepiness Score
FIM	:	Functional Independence Measure
HAD	:	Hospital Anxiety and Depression scale
HAD-A	:	Hospital Anxiety and Depression scale- Anxiety

HAD-D	**:**	Hospital Anxiety and Depression scale- Depression
IS	**:**	Ischemic Stroke
ISP	**:**	Persons with Ischemic Stroke
NFAC	**:**	New Functional Ambulation Classification
OSA	**:**	Obstructive Sleep Apnea
PMR	**:**	Physical Medicine and Rehabilitation
PSQI	**:**	Pittsburgh Sleep Quality Index
SD	**:**	Sleep Disorders
SF12	**:**	Medical Outcomes Study 12-Item Short-Form Health Survey "Short Form 12"
SF12-PCS	**:**	SF12-Physical Component Summary Score
SF12-MCS	**:**	SF12-Mental Component Summary Score
SF36	**:**	Short Form 36
SQ	**:**	Sleep Quality
TIA	**:**	Transient Ischemic Attack
TUG test	**:**	Timed up and Go Test
QOL	**:**	Quality of Life
WHO	**:**	World Health Organization

Keywords: Anxiety-Depression; Quality of life; Sleep disorders; Stroke

Introduction

Quality of Life (QOL) is defined by the WHO as individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns [1].

Sleep has beneficial effects on health. Some essential vital functions such as physical and neurological restoration, energy conservation and memory consolidation are performed during sleep [2].

A growing interest in the relationship between Sleep Disorders (SD) and stroke has been observed. Stroke provokes changes in brain functioning and has detrimental effects on the central nervous system. It can affect negatively Sleep Quality (SQ) by the appearance of new SD or the aggravation of pre-existing ones [3]. These disorders may play an important role in the prognosis of neurologic and psychiatric functions and thus in post-stroke recovery [4,5]. They may also have a significant impact on QOL of stroke patients. Moreover, psychological disorders and especially depression can considerably lengthen rehabilitation and recovery time among stroke survivors [6,7] and probably affect their QOL.

A better understanding of the determinants of QOL in persons with stroke would be important to help adapting and targeting intervention strategies to improve their QOL and their functional outcome. The objectives of the current study were to investigate functional status, anxiodepressive profile, SQ and QOL in persons with Ischemic Stroke (ISP) and to determine predictive factors of poor QOL in ISP.

Methods

A cross sectional descriptive study (January-August 2017) was carried out. We enrolled a sample of 50 individuals referred after an Ischemic Stroke (IS) to the Physical Medicine and Rehabilitation (PMR) department, Monastir University Hospital, Tunisia. All stroke survivors received written and verbal information and provided written informed consent prior to participating in the study.

We included individuals responding to the following criteria:

- IS dating for more than three months and confirmed by a cerebral computed tomography and/or magnetic resonance imaging.
- Independence for Activities of Daily Living (ADL) with a minimum of autonomy corresponding to a Barthel index [8] (BI) ≥ 60.

We did not include individuals with diagnosed and/or treated SD prior to IS and those being dependent to a third party on transfers and ADL. Besides, we did not include individuals having difficulties in reading French and Arabic.

The evaluation of QOL was performed according to the Arabic adaptation of the Medical Outcomes Study 12-Item Short-Form Health Survey (SF12) [9]. The physical component summary score (SF12-PCS) and the mental component summary score (SF12-MCS) represent the two main dimensions of health. The mean of both scores in the general population is equal to 50. (QOL is considered poor in individuals having a score less than 50).

Functional status of ISP was assessed using the BI for the global function assessment, the New Functional Ambulation Classification (NFAC) [10] for gate evaluation and the Timed up and Go (TUG) test [11] for dynamic balance. The BI contains 10 items assessing the degree of autonomy in ADL of patients with stroke. The total score varies from 0 (Maximum disability) to 100 (complete independence). A score of 60 to 79 indicates that the subject requires minimal help for ADL and a score of 80 to 100 indicates independence [8]. According to the NFAC, gait is classified in nine categories (from 0 to 8). Classes from 0 to 3 indicate gait with assistance. From class four, the patient is able to walk alone on a flat surface. The upper classes designate a more or less complete autonomy for the passage of stairs [10]. Dynamic balance was evaluated according to the TUG test. During this test, the subject is asked to stand up from a chair, to walk away for three meters then to return back to it. A TUG execution time of less than 20 seconds indicates independence for transfers without a significant risk of fall [11].

SQ was assessed according to the Epworth Sleepiness Scale (EpSS) [12] and the Pittsburgh Sleep Quality Index (PSQI) [13]. We used the Arabic and validated version of the EpSS [14]. The items assess the likelihood of drowsiness or falling asleep in eight common situations in daily life. It varies from 0 to 24. A score ≥ 8 indicates a poor SQ and a probable Obstructive Sleep Apnea (OSA). The PSQI was validated in French [15]. It ranges from 0 (no difficulty) to 21 points (major difficulties). A total score ≥ 5 indicates poor SQ.

The anxiodepressive profile was evaluated according to the Arabic and validated version of the Hospital Anxiety and Depression Scale (HAD). This score contains seven items evaluating anxiety (HAD-A) and seven items evaluating depression (HAD-D) [16,17]. For each item, four responses are possible with a score varying from 0 to 3 points. For each dimension (HAD-A and HAD-D), the score is between 0 and 21. A score greater than eight indicates a doubtful anxious or depressive state and a score greater than 10 indicates a certain anxious or depressive state [16].

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Science SPSS 20.0. Pearson correlation coefficient was used in the bivariate analysis. To perform a comparative study, we considered as of poor physical QOL, and as of poor mental QOL, patients having a SF12-PCS or SF12-MCS less than the median score obtained in each dimension. Therefore, for both dimensions, we identified two groups: poor SF12 (PCS or MCS) group and good SF12 (PCS or MCS) group.

In the univariate analysis of independent samples, we used the Chi-square test for qualitative variables, and the Student t test for Gaussian quantitative variables. A significance level of less than 5% was used for all statistical tests with a confidence interval of 95%. We dichotomized the quantitative variables by determining for each the threshold value from the ROC curve. Then, we performed a multivariate analysis by binary logistic regression (input method) to determine poor QOL predictors in ISP. The inclusion of independent variables in the regression model was done when their degree of significance was less than 0.2.

Results

Epidemiologic Characteristics of the Study Sample

The study sample was composed of 20 women and 30 men (Sex ratio= 1.5) with a mean age of 59.3 years ± 10.2 years. For medical history, 66% were hypertensive, 50% were suffering from dyslipidemia and 44% were diabetic. The majority of ISP had multiple cardiovascular risk factors. Only 10% had a single risk factor and 8% had no risk factors. In the majority of cases (66%), cerebral ischemic lesions affected the left hemisphere and the right side. The dominant side was affected in 64% of cases. The duration of hemiplegia varied from six months to seven years with a median of two years. In the majority of cases (48%), IS was evolving for more than six months and less than two years.

Clinical Characteristics of the Study Sample

According to the SF12, both physical and mental QOL were altered. The prevalence of poor physical QOL (SF12-PCS) and mental QOL (SF12-MCS) was 98% and 82% respectively. The prevalence of daytime sleepiness (EpSS ≥ 8) was 42%. According to the PSQI, the prevalence of poor SQ (PSQI>5) was 46%. Almost the half of the studied sample seemed to be depressive (HAD-D>8) (48%) and/or anxious (HAD-A>8) (52%).

The majority of ISP (80%) had a BI score between 80 and 100/100 testifying of complete independence. According to the NFAC, 40% of the subjects could walk alone on a flat surface. Climbing stairs was possible by using a ramp or cane, without assistance and / or supervision by a third party and 22% could

walk alone on flat surface and climb stairs alone without using the ramp or cane. In 72% of cases, the TUG test was between 10 and 20 seconds corresponding to a state of independence for basic transfers and ability to climb stairs and go out alone.

Physical QOL (SF12-PCS) seemed not to be correlated neither with the BI (r=0.234; p=0.103) nor with the TUG test (r= -0.031; p=0.829). Furthermore, there was no correlation between the SF12-PCS and the NFAC (r=0.007; p =0.963). There was a correlation between the SF12-PCS and the EpSS (r= -0.329; p=0.02) and between the SF12-PCS and the PSQI (r= -0.367; p=0.009). The greater these scores were the worse physical QOL would be. There was no correlation between the SF12-PCS and the HAD-A (r= -0.24; p=0.09), nor the HAD-D (r= -0.239; p=0.094).

No correlation was found between mental QOL and functional status as it was evaluated according to the BI (r=0.232; p=0.105), to the TUG test (r=0.144; p=0.318) and to the NFAC (r=0.170; p=0.239). Mental QOL (SF12-MCS) was correlated with the PSQI (r= -0.364; p=0.009) but not with the EpSS (r= -0.241; p=0.092). Mental QOL was correlated with anxiety (r= -0.638; p<0.001) and with depression (r=-0.562; p<0.001). The more anxious or depressive the subject was, the worse QOL he would have.

Predictive factors of Poor QOL in ISP

The univariate analysis found that poor physical QOL in ISP was associated with an IS history (p=0.041) and with the likelihood of OSA (EpSS) (p=0.009). It also concluded that poor mental QOL was associated with an IS history (p=0.041).

According to the HAD, poor SF12-MCS group had a certain anxious state and a doubtful depressive one. The difference with the other group was statistically significant (<0.001) (Table 1 and 2). Multivariate analysis concluded that predictive factors of poor physical QOL were: IS duration>1.75 years and EpSS>8. Predictive factors of poor mental QOL were: HAD-A>7.5 and HAD-D>7.5 (Table 3 and 4).

		Physical QOL: SF12-PCS			Mental QOL: SF12-MCS		
		Poor SF12-PCS group (n=25)	**Good SF12-PCS group (n=25)**	**p**	**Poor SF12-MCS group (n=25)**	**Good SF12-MCS group (n=25)**	**P**
Age (years) (M±SD)		61.5±9.6	57.1±10.5	**0.13**	**57.8±10.8**	**60.7±9.8**	**0.32**
Gender (n)	Men	15	15	1	**12**	18	0.083
	Women	10	10		**13**	7	
Marital status (n)	Single	0	1	1	0	1	1
	Maried	23	19	0.247	20	22	0.702
	Divorced	0	1	1	1	0	1
	Widow	2	4	0.667	4	2	0.667
Affected side (n)	Right	19	14	**0.14**	**15**	**18**	**0.37**
	Left	6	11		10	7	
IS duration (years) (M±SD)		2.6±1.7	2±1.6	**0.2**	**2±1.6**	**2.6±1.7**	**0.25**
Physical activity (n)	Sedentary	12	7	**0.15**	**10**	**9**	**0.77**
	ADL	13	17	0.248	15	15	1
	Sport activities	0	1	1	0	1	1
Medical History (n)	Diabetes	11	11	1	10	12	0.569
	HTA	17	16	0.765	14	19	0.136
	Dyslipidemia	14	11	0.396	12	13	0.777
	Auricular fibrillation	4	5	1	7	2	0.138
	TIA	6	9	0.355	8	7	0.758
	IS	13	6	0.041	13	6	0.041

IS: Ischemic Stroke; TIA: Transient Ischemic Attack; ADL: Activities of Daily Living

Table 1: Epidemiologic data comparison between poor QOL group and good QOL group.

	Physical QOL: SF12-PCS			**Mental QOL: SF12-MCS**		
	Poor SF12-PCS group (n=25)	**Good SF12-PCS group (n=25)**	**p**	**Poor SF12-MCS group (n=25)**	**Good SF12-MCS group (n=25)**	**p**
BMI (M±SD)	27.5±5.1	27.8±3.7	0.79	27.7±4.9	27.6±3.9	0.982
BI (M±SD)	87.8±10	90.4±12.8	0.5	87.4±14.6	90.8±12.1	0.375
TUG test (M±SD)	13.2±4.2	14.2±4.7	0.41	12.7±4.1	14.8±4.6	0.096
NFAC (M±SD)	6.2±1.2	6.3±1.2	0.91	6.4±1.1	6.1±1.2	0.297
EpSS (M±SD)	11.3±6.6	6.9±4.9	0.01	10.3±6.9	7.9±5.3	0.174
PSQI (M±SD)	7.3±3.9	5.3±4.5	0.1	7.3±4.4	5.2±4	0.082
HAD-A (M±SD)	9.5±5.8	8.2±5	0.38	11.9±4.6	5.8±4.3	<0.001
HAD-D (M±SD)	7.7±4.1	6.7±4.8	0.43	9.4±3.9	5.1±4	<0.001
SF12-MCS (M±SD)	37.4±10.5	41.1±11.5	0.24			
SF12-PCS (M±SD)				31.5±5.8	32.7±8.8	0.572

BMI=Body Mass Index; BI= Barthel Index; TUG= Timed Up and Go; NFAC= new Functional Ambulation Classification; EpSS= Epworth Sleepiness scale; PSQI= Pittsburgh Sleep Quality Index; HAD= Hospital Anxiety and Depression scale; MCS= SF12-Mental Component Summary Score; PCS= SF12-Physical Component Summary Score

Table 2: Clinical data comparison between poor QOL group and good QOL group.

Variable		**OR**	**CI 95% (OR)**	**p**
EpSS	>8	5	1.366-18.295	0.015*
IS duration	>1.75years	4	1.122-14.265	0.033*

*<0.05; OR: Odds Ratio; CI: Confidence Interval; EpSS= Epworth Sleepiness Scale; IS: Ischemic Stroke

Table 3: Predictive factors of poor physical QOL in IS patients.

Variable		**OR**	**CI 95% (OR)**	**p**
HAD-A	>7.5	17.3	3.625-82.751	<0.001**
HAD-D	>7.5	6.2	1.296-29.393	0.022*

**<0.001; *<0.05; OR: Odds Ratio; CI: Confidence Interval; HAD-A: Hospital Anxiety and Depression Scale- Anxiety; HAD-D: Hospital Anxiety and Depression Scale-Depression

Table 4: Predictive factors of poor mental QOL in IS patients.

Discussion

In the current study, we included a sample of 50 ISP with an autonomy corresponding to a BI ≥ 60. Both physical and mental QOL were altered in the study sample. The prevalence of poor physical QOL (SF12-PCS<50/100) and poor mental QOL (SF12-MCS<50/100) was 98% and 82% respectively. The prevalence of daytime sleepiness and a probable OSA was 42% (EpSS), the prevalence of poor SQ was 46% (PSQI). According to the HAD, about the half of the studied sample was depressive (48%) and/or anxious (52%). There was no correlation between functional status and QOL. Concerning SQ, the PSQI was correlated with both SF12-PCS (r= -0.367; p=0.009) and SF12-MCS (r= -0.364; p=0.009). The SF12-PCS was also correlated with the EpSS (r= -0.329; p=0.02). The greater sleep scores were the worse QOL would be. Mental QOL was correlated with anxiety (r= -0.638; p<0.001) and with depression (r= -0.562; p<0.001). The more anxious or depressive ISP were, the worse mental QOL they would have. According to this study predictive factors of poor physical QOL were: IS duration>1.75 years (OR=4; p=0.033) and EpSS>8 (OR=5; p=0.015). Predictive factors of poor mental QOL were HAD-A>7.5 (OR=17.3; p<0.001) and HAD-D>7.5 (OR=6.2; p=0.022).

The results of the current study suggested that SD affected negatively QOL. SQ in ISP may be altered for many reasons. After a stroke, patients may suffer from an unrecognized OSA in which daytime drowsiness and fatigability during the day are the main symptoms. SQ could also be impaired because of insomnia characterized by difficulty falling asleep, staying asleep, and waking up early with a non-recovering sleep. Insomnia is responsible for fatigue, daytime sleepiness, irritability, memory problems and difficulties in concentration [18]. All these factors may affect both mental and physical QOL. Furthermore, this study suggested that daytime sleepiness had negative consequences specially in the physical functioning and that ISP with a probable OSA were five times more at risk of having a worse physical QOL.

Sterr et al. [19] in 2008 found that excessive daytime sleepiness affected negatively the vitality of stroke patients. Besides, poor SQ was associated with pain and physical role limitation in these patients. It should be noted that physical role and pain constitute two physical dimensions of the SF36 and that vitality constitutes a mental dimension evaluated by the same score.

Manocchia et al. [20] found that SQ was associated with poor mental QOL (SF36) in patients with chronic diseases. Misdiagnosed symptomatic or asymptomatic OSA was independently associated with a probability of impairment of QOL in healthy individuals [21].

Kwon and Shin [22] in 2016 examined the relationship between SQ and QOL in a 6-year follow-up elderly population using the SF12. They found that SQ was significantly associated with physical and mental QOL. Patients with poor SQ had significantly lower PCS and MCS scores than patients with good SQ. Their functional performance was significantly altered although they appeared to be in good general health.

According to this study, it seemed that the more anxious or depressive ISP were, the worse QOL they would have. In fact, mental QOL was correlated with anxiety (r= -0.638; p<0.001) and with depression (r= -0.562; p<0.001). Besides, a HAD-A>7.5 and HAD-D>7.5 were predictive factors of poor mental QOL. Kielbergerva et al. [23] in 2015 found that anxiety, depression, and raised brain natriuretic peptide levels were the most important covariates of impaired QOL in post-stroke patients. Moreover, a decreased SF-36 score (≤40) represented an independent surrogate of increased additive mortality risk. De Bruijn et al. [24] demonstrated that depression was associated with worse physical and mental QOL and anxiety with lower scores on the mental QOL in young patients 4.5 years after a stroke of mild severity. In another study including 162 Indian stroke survivors, Raju et al. [25] concluded that the presence of anxiety, depression (HAD) and functional dependence (Functional Independence Measure: FIM) were predictors of impaired QOL.

Physical QOL was impaired in 98% of cases and mental QOL in 82% of cases in the study sample. The median scores for SF12-PCS and SF12-MCS were low (30.05 and 38.55 respectively). In the study of Gallien et al. [26] an impaired QOL (SF36) was also seen in patients six years after stroke, but less important than that observed in the ISP enrolled in the current study. Mayo et al. [27] found comparable results in a six-month stroke patient, 44.2% of them were still in inpatient rehabilitation structures. The scores of QOL obtained were better in hospitalized patients. According to the authors, this would be due to their presence in structures totally adapted to the handicap. The link between an altered QOL and the degree of motor handicap is not surprising. ISP included in the current study had obviously an autonomy offering them a certain level of independence, but both their physical and mental QOL were altered and this two years after IS.

We found that SD were prevalent among ISP in the subacute or chronic phase of stroke (median IS duration of two years). The prevalence of daytime sleepiness was 42% testifying of a probable OSA. According to the PSQI, the prevalence of poor SQ was 46%. Sterr et al. [19] evaluated the SQ of 20 stroke patients in the chronic phase of stroke. The prevalence of daytime sleepiness was 45% (EpSS) and that of poor SQ was 65% (PSQI). We noticed that the half of the studied sample was depressive (48%) and/or anxious (52%). Studies treating mood disorders in stroke populations focused mainly on depression. The majority of studies indicated that its prevalence ranges from 20% to 50% and that it persists three to six months after cerebral infarction [28,29]. Post-stroke depression had a negative impact on mortality, rehabilitation and

functional status of patients [7]. On the other hand, post-stroke anxiety was recently explored with a prevalence ranging from 4% to 28% according to the studies [30].

In addition to physical and mental impairment resulting from stroke itself, the presence of SD also affects negatively QOL in ISP. Rehabilitation process may be compromised if patients experience poor SQ, daytime sleepiness and poor QOL. Furthermore, the potential impact of psychologic disorders on QOL, may affect patient involvement in his rehabilitation program. A depressive patient may lack for motivation during rehabilitation sessions, an anxious one may be afraid from fall when walking without assistance despite his ability to go through the exercise.

Thus, diagnosing and treating SD and psychologic disorders are of a major importance in post-stroke patients. These problems deserve serious clinical approach to optimize functional outcome and improve QOL of ISP in PMR.

Study Limitations

This study has a design limitation, in fact we did not calculate the sample size, and this would have resulted in Type II error. The frequency of poor QOL and SD may have been influenced by the relatively low sample of ISP included.

Conclusion

Despite the limitations of the study, daytime sleepiness and psychologic disorders were found to have a negative impact on QOL in ISP. Further studies are needed to confirm these results. Physiatrists and neurologists must understand and be able to better manage these different parameters that seem to have an important impact on QOL of ISP. Moreover, conventional polysomnography has to be performed whenever OSA is suspected to prevent stroke recurrences and improve functional outcome and QOL of patients with stroke.

Conflict of Interest Disclosure: The authors declare that they have no conflict of interest.

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