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List of Abbreviations

AChEI	: acetylcholine esterase inhibitors
AChR	: acetylcholines receptor
ADEM	: acute disseminated encephalomyelitis
AHI	: apnea hypopnea index
ASF	: apnea symptoms frequency
BAD	: Becks depression inventory
BAI	: Beck anxiety index
BDZ	: benzodiazepines
BMI	: body mass index
CASI	: cognitive abilities screening instrument
CBT	: core body temperature
CFS	: chronic fatigue syndrome
CI	: confidence interval
CIDP	: chronic inflammatory demyelinating polyneuropathy
CNS	: central nervous system
CPAP	: continuous positive airway pressure
CRP	: C-reactive protein
CSF	: cerebrospinal fluid

DA	: dopamine
DAS28	: Disease Activity Score 28 for RA
DM	: dermatomyositis
DRN	: dorsal raphe nucleus
Dspz	: dorsal subparaventricular zone
EEG	: electroencephalogram
EMG	: electromyogram
EOG	: electro-oculogram
ESS	: Epworth sleepiness scale
FQSQ	: functional outcomes of sleep questionnaire
GABA	: γ -aminobutyric acid
GBS	: Guillain Barre syndrome
HLA	: human leukocyte antigen
HLA	: human leukocyte antigen
ICU	: intensive care unit
IFN-B	: interferon beta
IL-6	: interleukin 6
JIA	: juvenile idiopathic arthritis
LE	: limbic encephalitis

IV

MACTAR : The McMaster Toronto Arthritis patient preference questionnaire

MG : myasthenia gravis

MGUSP : monoclonal gammopathy of undetermined significance

mHAQ : Modified Health Assessment Questionnaire

MMSE : minimal status examination

MRSA : methicillin resistant *Staphylococcus aureus*

MS : multiple sclerosis

MSLT : multiple sleep latency test

MWT : maintenance of wakefulness test

NAID : neurologic autoimmune disorders

NE : norepinephrine

NIPPV : noninvasive intermittent positive pressure ventilation

NK : natural killers

NREM : non rapid eye movement

ODI : oxygen desaturation index

OR : odds ratio

OSA : obstructive sleep apnea

PAP : positive airway pressure

V

PGO	: ponto-geniculo-occipital
PLM	: periodic leg movement
PM	: polymyositis
PRL	: prolactin
PSD	: partial sleep deprivation
PSG	: polysomnography
PSQI	: Pittsburgh sleep quality index
PW	: paradoxical weakness
QMGS	: quantitative myasthenia gravis score
QOL	: quality of life
RA	: rheumatoid arthritis
RADAI Index	: Rheumatoid Arthritis Disease Activity Index
RBD	: REM sleep behavior disorder
REM	: rapid eye movement
RLS	: restless leg syndrome
Scale (CESD): The Center for Epidemiologic Studies Depression	
SDB	: sleep disordered breathing
sIBM	: sporadic inflammatory body myositis

VI

SNe	: substantia nigra pars compacta
SOL	: sleep onset latency
SSc	: systemic sclerosis
SSS	: Stanford sleepiness scale
SWS	: slow wave sleep
TNF	: tumor necrosis factor
TSH	:thyroid stimulating hormone
VGKC	: voltage gated potassium channel
VPAG	: ventral periaqueductal grey matter
VTa	: ventral tegmental area
W	: waking
WASO	: wake after sleep onset

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Introduction

A correlation between sleep loss and development of different pathologies has recently been revealed by numerous studies. The potential magnitude of this problem is highlighted in the 2013 International Bedroom Poll, where more than half of the population in industrialized countries report insufficient sleep on a regular basis (*Christfersson et al., 2014*).

Sleepiness, fatigue and sleep fragmentation are among the most frequent symptoms of acute and chronic inflammatory neurologic autoimmune disorders (NAID). While current knowledge supports a strong involvement of both the neuroendocrine and the immune systems. Processes underlying homeostatic and circadian sleep regulation have an influence on functions of the immune system (*Khatami et al., 2008*).

In one study, many patients with chronic inflammatory demyelinating polyneuropathy (CIDP) reported sleep difficulties. It may be hypothesized that paresthesias and pain interfere with the sleep of these patients. However, a more in-depth evaluation is necessary. Improved sleep may favor quality of life for patients with CIDP (*Santos et al., 2014*).

In a study the prevalence of restless leg syndrome (RLS) in patients with CIDP was significantly higher than controls. Screening for RLS in CIDP patients may be appropriate, particularly in those with weakness, disability, and motor axonal loss in the lower limbs (***Rajabally and Rauhl, 2010***).

Another study confirms a high prevalence of RLS in inflammatory neuropathies as CIDP as well (***Luigetti et al., 2013***).

Disease severity maybe considered to be a Myasthenia Gravis-specific risk factor for patient-reported sleep disturbance. An increased incidence of sleep disorders, especially sleep disordered breathing and obstructive sleep apnea (OSA) has been noted in Myasthenia Gravis (MG) patients. An association between corticosteroid use and risk of sleep disorders has been reported, but the influence of disease severity on sleep quality is not clear (***Lapiscina et al., 2011***).

A prospective study demonstrates a benefit of napping on weakness in a neuromuscular disorder and suggests that napping could be considered as a simple intervention to help mitigate weakness in patients with MG (***Kassardjian et al., 2013***).

It is clear that sleep disturbances are prevalent in Multiple Sclerosis (MS), and associated with significant consequences for patients (***Kaminska et al., 2011***).

In a study it was found that yawning and napping provide symptom relief among patients with MS. Not getting a good night's sleep made MS symptoms worse for many patients (***Gallup et al., 2010***).

The exact mechanism of sleep disturbances in Guillain-Barre syndrome (GBS) is speculative. These patients experience sensory disturbances including pain, have recent onset motor disability, require prolonged hospital stay and exhibit anxiety and may be expected to have sleep disturbances.

The CSF hypocretin-1 (a hypothalamic neuropeptide deficient in narcolepsy) levels, measured in a group of patients in a study, were lower in patients of GBS with hallucinations than in those without them. The authors proposed involvement of lateral hypothalamus in GB syndrome that governs the sleep architecture.

Treatment of underlying causes like pain, anxiety; early institution of specific treatment for GB syndrome like plasma exchange or intravenous immunoglobulins and reassurance might be some of the steps in alleviating the sleep disturbances (***Karkare et al., 2013***).

Sleep complaints are an important part of the symptomatology of rheumatologic disorders. Nocturnal sleep disruption is a common finding and it is expressed in the analysis of the sleep EEG (*Abad et al., 2008*).

It was found in a study that sleep disturbance and fatigue are prevalent among children with juvenile idiopathic arthritis (JIA) and Juvenile Dermatomyositis (JDM). Sleep disturbance and fatigue are strongly related to increases in pain (*Avie et al., 2008*).

While in another study it was found that a high frequency of obstructive sleep apnea in patients with inflammatory myopathies (dermatomyositis, polymyositis, and sporadic inclusion body myositis). Weakness of the oropharyngeal muscles could explain this finding and the possibility that these alterations play a role in the persistence of fatigue (*Callaghan et al., 2009*).

Rapid-eye-movement sleep behavior disorder frequently occurs in the setting of neurological conditions involving the brain stem, including demyelinating lesions like acute aseptic limbic encephalitis (*Lin et al., 2009*).

A number of patients have prominent and early sleep-wake disturbance, insomnia, restless legs syndrome and obstructive sleep apnea as a feature of autoimmune mediated limbic encephalitis. Hypersomnia with

fragmented night sleep has been described in patients with anti-Ma encephalitis as well (*Anderson et al., 2012*).

A study suggest that sleep disruption, and in particular sleep disordered breathing might be highly prevalent in sporadic inclusion body myositis. An association with the severity of muscular impairment, and in particular with dysphagia, can be hypothesized (*Marca et al., 2013*).

Aim of the Work

To highlight the recent updates regarding the interrelation between sleep, sleep-related disorders and some autoimmune neurologic diseases and the impact of this relation on disease outcome and quality of life of patients with these diseases.