REVIEW ARTICLE

Parasomnias: An Overview

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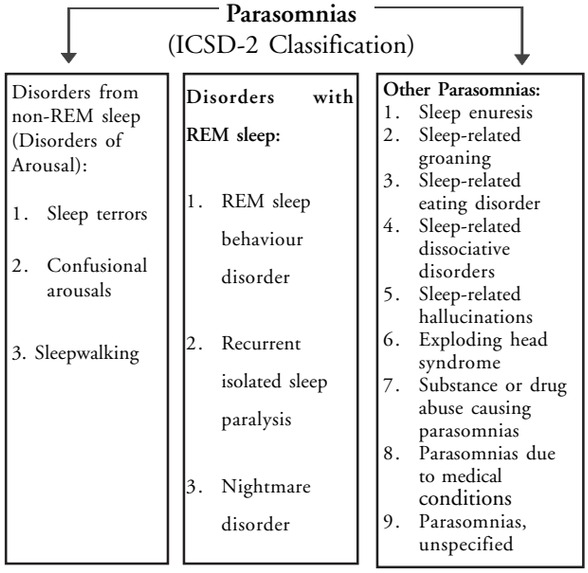
Parasomnias are undesirable sleep-related movements, behaviours, emotions, perceptions and autonomic manifestations, which can occur in any stage of sleep – as a patients enter sleep, within sleep or during arousals from sleep, as defined by the International Classification of Sleep Disorders (ICSD)-2 [1]. Hence, parasomnias are non-reflex automatisms with absence of conscious violation.

A recent study by Panda et al reported the prevalence of sleep disorders to be 20-34.2% in the general South-Indian population. The most commonly reported parasomnias in this study were sleep talking (2.6%), nightmares (1.5%), somnambulism (0.6%) and night terrors (0.6%)[2].



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Non-REM parasomnias

1. **Sleep Terrors (Night Terrors/ Pavor Nocturnes)**: Arising from stage N3, these are characterised by a sudden arousal associated with a piercing scream or cry in the initial hours after sleep onset. This is associated with autonomic hyperactivity in the form of tachycardia, tachypnoea, sweating, flushing of skin, mydriasis and behavioural manifestations. The patient may act in a panicky, anxious, afraid or agitated manner and does not want to be touched, consoled or comforted. These events can last from 30 seconds to 5 minutes. Most patients are amnesic to the event the following morning; although a few of them maintain dream imagery. Violent behaviours in adults may prove to be harmful for patients and bed partners. Self-injury during an episode may mimic a suicidal attempt; legal implications of these have been reported in the literature. Prevalence varies with age from 1% in the geriatric population to 6.5% in children [1,3].
2. **Confusional Arousal:** This is a condition of partial or incomplete awakening usually out of slow wave or stage N3. This is associated with slow mentation, relative unresponsiveness to the environment, occasional complex behaviours and partial or total amnesia for the event. There is no automatic hyperactivity or wandering seen in these patients. Prevalence ranges from 2.9% in adults to 17.3% in children. Genetic factors play a significant predisposing role as there may be a family history of similar childhood nocturnal behaviours. Precipitating factors for this condition include sleep deprivation, fever, infections, centrally active medications (hypnotics, antidepressants and tranquilisers), sleep-disordered breathing and periodic limb movements of sleep [1,5].

Two variants of confusional arousals are known:

Severe Morning Sleep Inertia: This is another light NREM (not SWS) sleep variant, which is clinically similar to typical confusional arousals [8].

Abnormal Sexual Behaviours such as violent masturbations, sexual assaults and loud sexual vocalisations, fondling the bed partner, sexual intercourse with or without orgasm and agitated sexual behaviours in adults and adolescents have been reported as variants of confusional arousals.

3. **Sleep Walking (Somnambulism)**: This arises out of SWS and is usually observed in the first third of nocturnal sleep. The episodes are characterised by ambulatory phenomena during sleep with associated complex behaviours such as eating, cooking, cleaning the house, unlocking doors and sexual activities. Prevalence in children is about 17%, whereas in adults it decreases to 3%, as sleep walking decreases with age, more significantly after puberty. Genetic predisposition is seen in these patients (with positive *DQB1* gene) especially if a first-degree relative is affected with this parasomnia as the risk increases 10-fold when compared with the general population. Precipitating factors include sleep deprivation, fever, centrally active substances such as hypnotics, stress and sleep-disordered breathing [1,3,9].
4. **Somniloquy (Sleep Talking)**: Although not listed under the ICSD-2 classification, this is a common sleep-related behaviour involving vocalisation, many a times without any awareness of the event. Diagnostic PSG reveals events mostly restricted to N1, N2 and REM sleep. Prevalence is uncertain, although it is closely associated with obstructive sleep apnoea and other disorders of arousal in adults [1,3,6,9].

REM Parasomnias

1. **REM Sleep Behaviour Disorder (RBD)**: This is characterised by complex and elaborate motor activity associated with agitation and violent dream enactment with an abnormal elevation of the limb or chin tone during stage REM sleep (as early as 90 minutes after falling asleep and more frequently in the latter part of the night). Prevalence is estimated to be 0.5% with an increased male predominance (9:1), especially in men aged more than 60 years. There is always a memory and clear dream mentation for the event. It has been closely associated in patients with Parkinsonism [1,2,5,9].

RBD maybe classified into acute and chronic forms:

Acute form: This is frequently seen in substance- or medication-related (rapid withdrawal from alcohol, abrupt discontinuation of sedative hypnotics, TCAs, MAOIs, cholinergic agents, SSRIs), CNS injury (stroke, demyelination) or metabolic derangements.

Chronic or idiopathic form: The most common predisposing factor for this type is old age and progressive increases in severity. It is commonly associated with underlying neurological disease and injury such as neurodegenerative disorders, cerebrovascular accidents and multiple sclerosis [12].

2. **Recurrent Isolated Sleep Paralysis**: This is characterised by a pathological dissociation between the level of alertness and the generalised muscle atonia typical of REM sleep, leading to the feeling of being paralysed but entirely alert (as cognition usually remains intact). This inability to perform voluntary motor function during sleep causes sleep–wake cycle disturbances (jet lag, shift work, etc.) [2].
3. **Nightmares**: These are vivid, prolonged dream sequences that become progressively intense, anxiety and fear provoking, eventually terminating in an arousal and a vivid recall. Events may increase when the person is under stress especially after traumatic events. They vary in prevalence, depending on age, comorbid conditions and frequency of occurrence from 2 to 85% [3].

Evaluation of Parasomnias:

1. A detailed history (sleep and non-sleep related) from the patient and the primary caregiver who has witnessed such events should be taken. Family history maybe vital to support the clinical diagnosis.
2. Complete EEG monitoring during a video EEG maybe indicated.
3. An overnight video PSG with extended limb leads (all four limbs) and EEG electrodes (epilepsy montage), accessory submental/EMG channels is suggested for parasomnias.

Summary of Treatment Options

Sleep Hygiene:

1. Restrict sleep to a fixed number of hours as too much time in bed can disrupt the quality of sleep.

Table 1: Table elaborating on parasomnias and their characteristics with therapeutic options [1,3,4,5,8,9]

S.No.	Parasomnia	Alternative Names	Epidemiology	Predisposing & Precipitating Factors	Characteristics	Differential Diagnosis	Non-Pharmacological Therapy	Pharmacological Therapy
1.	Sleep terrors	Night terrors, Parvor nocturnus	Overall 1-6.5% in children and between 4 &12 years & 2.2% in adults	•Genetic •SRBD •Psychiatric conditions like bipolar disorder, non-psychotic depressive disorders & anxiety disorders	•Arousal from SWS in the first third of the night •Associated with inconsolable & intense fearful piercing scream, autonomic features & behavioural manifestations •Unresponsive to external stimuli •Confused & disoriented when awakened •Post episode amnesia Vocalisation ±	•RBD •Confusional arouslas •Sleepwalking •Parasomnia overlap disorder •Nocturnal complex partial seizures •Frontal lobe seizures •Panic attacks •Malingering	•Scheduled awakenings •Hypnosis •Relaxation therapy	•Trazodone •Paroxetine •Diazepam (5-10 mg) •Clonazepam (0.5-2 mg) •Hydroxytryptophan (2mg/kg HS) •Imipramine / Clomipramine
2.	Confusional arousals	Sleep drunkenness, excessive sleep inertia, Schlaftrunkenheit, l'ivresse du sommeil, Elpenor syndrome	Overall 17.3% between the ages 3 &13 years, and 2.9-4.2% between the ages 15 & 35 years	•Genetic factors •Shift work •Other sleep disorders •Stress •Bipolar disorder •Depressive disorders	•Childhood form is benign and diminishes after 5 yrs •Adult variant persists for a long term without remissions •Recurrent mental confusion or behaviour during an arousal from nocturnal sleep or a daytime nap •May arise form any stage of NREM sleep, although predominantly SWS	•Nocturnal partial seizures •Sleep walking •Sleep terrors •RBD	Scheduled awakenings	Imipramine Clomipramine Clonazepam
3.	Sleep walking	Somnambulism	Overall 17% in children 3% in adults with no gender difference	•Sleep deprivation •Fever •Centrally active hypnotic medi-	•Arousal from SWS characterised by ambulatory phenomena during sleep •Calm behaviour, may also	•RBD •Sleep terrors •Parasomnia overlap	•Scheduled awakenings •Stress management?	•Clonazepam (0.5-2mg) •Trizolam (0.25mg HS) •Flurazepam •Imipramine (20-100mgHS)

				cation (Zolpidem) •SDB	include complex actions such as cooking, cleaning sexual activities, etc. •Awakening a person during the episode may lead to agitated, violent or injurious behaviour •Spontaneous termnation of episode occurs in unusual places •No recall of the present after the episode •Strong genetic correlation linked to DBQJ genes	syndrome •Sleep-related epilepsy •Malingering	•Hypnosis	•Melatonin (5mg before bedtime) •Paroxetine? •Diazepam(2.5 mg)
4.	REM sleep behaviour disorder	Oneirism, Stage 1 REM, REM without atonia, Paradoxical sleep without atonia, REM sleep motor parasomina	Overall 0.38% in the general populaltion & 0.5% in elderly men	Older age, Underlying neurological disorders, Parkinsonism, dementia with lewy bodies, narcolepsy & stroke Medication: Venlafaxine, SSRIs, Mirtazapine, Brainstem tumors in children, Tourette syndrome, mobius syndrome, autism	•Progressive course •Associated with RBD, neurodegenerative disorders & synnucleo-pathies. •Manifest as enactment of distinctly altered, unpleasant,action -filled, violent dreams with patient arousal at the end of the episode •Isomorphism maybe a feature (coherent story of dream & actions) •Eyes are usually closed during the episodes •Sleep-related injuries to self or the bed partner may be a complication •Parasomnia overlap syndrome	•Sleepwalking •Sleep terrors •Nocturnal seizures •OSA •Hypnogenic paroxysmal dystonia •Rhythmic movement disorders •Sleep-related dissociative disorder •Fightening hypnopompic hallucinations •Post-traumatic stress disorder	None	•Melatonin(3-12mg) •Clonazepam (0.5-2mg) •Donepezil (10-15mg) •Rivastigmine (9-12mg) •Pramipexole (0.75-2.5mg) •Levodopa •Fluvoxamine

					-RBD coexists with a disorder of arousal -Male predominant in all ages, -Maybe idiopathic or symptomatic various disorders like MS, Narcolepsy, Brain tumour, trauma, etc. •Status dissociatus -Extreme form, -Maybe associated with disturbed dreaming resembling RBD -Always associated with underlying medical condition like Narcolepsy, Parkinsonism, dementia, MSA, etc.			•Clomipramine (25-50 mg HS) •Imipramine (25-50 mg) •Protriptyline (2-10mg) •Fluoxetine (10-30mg) •Viloxazine (25-50mg) •Femoxetine (100-150mg)
5.	Recurrent isolated sleep paralysis	Hypnagogic & hypnopompic hallucinations, Predormital & postdormital paralysis, Kanashibari, Ghost oppression phenomena, Old hag phenomena	Overall 15-40% in people <30yrs	Irregular sleep-wake schedules Metal stress Personality factors	•Adolescent onset •Arise on awakening patients from nocturnal sleep (REM). •Inability to move trunk & all four limbs at sleep onset or awakening •Episodes last seconds or minutes	•Neuropathies •Cataplexy •Nocturnal panic attacks •Atonic seizures •Conversion disorders •Hypokalemic periodic paralysis	None		
6.	Nightmare disorder	REM nightmares,	Overall 10-50% in children aged	Females, lower socioeconomic	•Recurrent episodes of awakening from sleep	Seizures Sleep terrors	•CBT •Mixed	•Prazosin (1-4 mgOD) •Trazodone (50-200mg)	

		Recurrent nightmares, Dream anxiety disorder, Anxiety dreams	3-5 years, 50-85% in adults, 2-8% of the general population	status	•Recall of fearful, anxious & other dysphoric emotions •Full awareness on awakening. •Episodes usually occur in the latter part of the sleep	Sleep paralysis Narcolepsy, Panic attacks Sleep-related dissociative disorder	therapies	•Nefazodone (400-600mg) •Gabapentin (300-3600 mgOD) •Topiramate (75mg OD) •Olanzepine (10-20mgOD) •Cannabinoid
7.	Sleep enuresis	Eneuresis nocturnal, Nocturnal bedwetting, Primary/ familial/ functional/ idiopathic/ monosymptomatic/ essential eneuresis/ night wetting, sleep related eneuresis	About 30% of 4-year olds, 10% of 6 year olds, 7% of 7-yr-olds 5% of 10-yr olds, 3% of 12-olds, 1-2% of 18 yrs olds have complaint.	<u>Primary enuresis:</u> •Lack of normal increased vasopressin with failure to arouse despite intact bladder sensation <u>Secondary enuresis</u> •Associated with inability to concentrate urine as in Diabetes insipidus, Diabetes mellitus etc. •Increase during production secondary to caffeine/ diuretic etc. ingestion •Urinary tract pathology •Chronic constipation and encopresis	•Primary enuresis is a problem if it persists beyond 5 years when a child in never consistently dry during sleep. •Recurrent invoulntary voiding during sleep, occuring at least twice weekly •Secondary enuresis if consistently dry during sleep for a minimum of 6 months •Secondary causes maybe: Urinary tract infection, Diabetes, Epilepsy, sickle cell disease	Primary sleep enuresis from secondary sleep enuresis	•Behavioural Modifications •Biofeedback •Conditioning •Alarm therapy •Acupuncture •Spinal block •Bladder transsection	•Desamino vasopressino-D argenine •Oxybutynin •Tolterodine •TCA's (impramine-25-75mg) •Verapamil

8.	Sleep related groaning	•Catathrenia, •Expiratory groaning •Sleep related respiratory dysrhythmia with brady-pnea & vocali sation •REM sleep associated long inarticulate expiratory phonation	Rare, prevalence unknown	•Neurologic pathology •OSA •Psychosocial stressors	History of other parasomnia	•Insidious onset •2-6 hrs after sleep onset, last for 2-49 secs, Repeats in clusters 2-60 mins many times, usually in REM sleep •PSG respiratory sound monitoring reveals respiratory dysrhythmia predominantly during REM sleep	•Central sleep Apnea •Sleep Talking •Stridor •Sleep related laryngospasm •Nocturnal Asthma	CPAP	NONE
9.	Sleep related Eating Disorder	Sleep related Binge eating, Nocturnal binge eating disorder	Higher in females, 4-6-16.7% in various groups that self reported the disorder	•Cessation of iga-rette smoking •Alcohol cessation •Acute stress •Autoimmune hepatitis •Encephalitis •Sleep related dissociative disorder •Medication induced SRED is seen with Zolpidem, Triazolam & other psycho-	•Recurrent episodes of involuntary eating & drinking during arousals from sleep •Typically occur during partial arousals with partical recall •Maybe problematic due to consumption of peculiar forms or combi-nations, dangerous behaviours while in per-suits of food or while cook-ing,insomnia from sleep disruption, sleep related injury, morning anorexia or	•NES •Kleine Levin syndrome	None	•Pramipexole •Topiramate

				tropic agents-Lithium carbonate & anticholinergic medication	abdominal distention, weight gain etc •Occur anywhere in the sleep cycle •Preference for high calorie foods, that are not routinely consumed. •Hunger and thirst are paradoxically absent during these periods of compulsive eating •Associated with other sleep disorders: OSA, RLS PLMD etc			
10.	Sleep related dissociative disorders	Norcturnal dissociative disorder, hysterical somnambulistic trance, Dissociative pseudoparasomnia	Unknown	•Past history of physical emotional or sexual abuse •Psychiatric disorders •PTSD •Mood disorders •Anxiety disorders •Suicidal tendency •Self mutilating attempts	•History of daytime dissociative disorder is usually present •Patients can scream, run, injure themselves or have other sleep related violent behaviours •Episodes may last from minutes to hours • Nocturnal fugues, eating uncooked food, binge eating, confusional states etc can also occur	•Parasomnias Sleep walking, sleep terrors, RBD •Disorders of arousal •Toxic metabolic states • Medical disorders	CBT	None
11.	Sleep related Hallucinations	Hypnopompic/ hypnagogic hallucinations, Complex,	25-37% hypnagogic hallucinations, 7-13% hypnopompic hallucinations	Younger age Drug Use Past alcohol use Anxiety Mood disorder Sleep onset	•Predominantly visual but also include auditory, tactile or kinetic phenomena •Hallucinations at sleep onset-Hypnagogic	•Nightmares •Exploding head syndrome •RBD •Sleepwalking •Seizures	None	None

		nocuturnal visual hallucina-tions		insomnia Perceived insufficient sleep	hallucinations •Hallucinations after waking up in the morning-Hypnopompic hallucinations •More common in adolescence and early adulthood •Frequency decreased with age	•Migraine •Anxiety disoders		
12.	Exploding Head Syndrome	Sensory Sleep Starts, Sensory sleep shocks	Unknown, more common in females	Stress	•Sudden loud imagined noise or a sense of explosion in the head, painless, as the person sleeps or wakes up at night •Clustering of episodes over several nights with a gap of weeks to months •Associated with fright, flash of light, myoclonic jerks •Immediate arousal following event	•Hypnicjerks •Idiopathic stabbing headache •Thunderclap headache •Hypnic headache •Sleep related migranes •Cluster headaches •Nocturnal paroxysmal hemicrania •Nocturnal panic attacks •Nightmares •Sleep starts •Simple partial seizures	None	•Nifedipine •Clomipramine •Flunarizine

Table comparing the difference in characteristics between Sleep Terror and Nightmares

S. No.	Characteristics	Sleep Terror	Nightmare
1	Timing during the night	Initial period (first third)	Usually early mornings (last third- REM)
2	Movements	Common	Rare
3	Severity	Severe	Mild
4	Vocalisation	Common	Rare
5	Autonomic hyperactivity	Severe and intense	Mild
6	Amnesia	Absent	Present
7	State on waking	Confused/ disoriented	Very rare
8	Injuries	Common	Rare
9	Violence	Common	Rare
10	Displacement from bed	Common	Very rare

2. Regular exercise (for about 40 minutes each day) is beneficial. Ideally it should be finished 6 hours before bedtime.
3. A hot bath before bedtime may be beneficial as it raises the body temperature.
4. Circadian factors: Regular timings for getting in and out of bed, appropriate timings of light exposure.
5. Drugs effects: Smoking, caffeine and intake of stimulants are best avoided a few hours prior to bedtime.
6. Diet: Heavy, spicy meals are best avoided 3 hours prior to bedtime.
7. Bedroom settings: Dark, quiet, comfortable temperature, comfortable bed and pillow.

Cognitive Behaviour Therapy (CBT)/BIofeedback/ Hypnosis/Relaxation Therapy (RT):

Behavioural modifications by seeking CBT sessions are recommended as the first line of therapy in certain parasomnias and as second-line therapy have been shown to be beneficial to some of the parasomnias. Even as adjuvant therapy, CBT/RT/Biofeedback have shown a positive response in long-term management.

CBT involves a psychotherapist who caters to sleep-related psychological stresses, which are modified gradually to help patients.

Table demonstrating similarities and differentiating features between the most common parasomnias

S. No.	Features	Confusional Arousals	Sleep Terrors	Sleep walking	Nightmares	RBD
1	Time	Early	Early	Early-Mid	Late	Late
2	Sleep stage	SWA	SWA	SWA	REM	REM
3	EEG discharges	-	-	-	-	-
4	Scream	-	++++	-	++	+
5	Autonomic activation	+	++++	+	+	+
6	Motor activity	-	+	+++	+	++++
7	Arousals	-	-	-	+	+
8	Duration (minutes)	0.5-10	1-10	2-30	3-20	1-10
9	Post-event confusion	+	+	+	-	-
10	Age (most common presentation)	Child	Child	Child adult	Child–Young	Older adult
11	Genetics	+	+	+	-	-
12	Organic CNS lesion	-	-	-	-	++

Relaxation techniques like meditation, yoga, pranayam, etc. have also shown tremendous benefits in patients with parasomnias.

Summary

Identification of parasomnias is essential to prevent misdiagnosis. An elaborate clinical history of the patient and bed partner/primary caregiver is vital for appropriate diagnosis of parasomnias. There are a few grey areas of overlap between clinical conditions that mimic parasomnias and may give rise to confusion in diagnosis; but appropriate history, examination and investigations leave no room for any doubts before deciding on pharmacological and non-pharmacological management strategies.

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