



FATAL PROPOFOL ABUSE AMONG HEALTHCARE PROFESSIONALS: A TWO-CASE SERIES AND REVIEW OF NEUROPHARMACOLOGICAL MECHANISMS

Anaesthesiology

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ABSTRACT

Background Propofol is a widely used intravenous anaesthetic agent with favourable pharmacokinetic properties and rapid recovery characteristics. Although traditionally regarded as having low abuse potential, increasing evidence suggests that propofol can produce euphoric and reinforcing effects, predisposing susceptible individuals to addiction and dependence. Healthcare professionals are particularly vulnerable because of occupational exposure and unrestricted access to the drug. **Methods** A retrospective review of two fatal cases of propofol abuse encountered over a ten-year period at a tertiary care teaching hospital was undertaken. Available clinical information, toxicological findings, occupational exposure, and patterns of drug access were analysed. A review of literature concerning the neuropharmacological mechanisms underlying propofol dependence and previously reported cases of propofol abuse was also performed. **Results** The first case involved a 30-year-old male intensive care unit nurse with occupational access to propofol. Toxicological analysis demonstrated a blood propofol concentration of 5.3 µg/ml. The second case involved a 32-year-old anaesthesia technician who developed withdrawal symptoms and was subsequently hospitalised. Toxicological examination revealed a blood propofol concentration of 4.02 µg/ml along with concomitant sedative agents. Both individuals had no documented history of prior substance abuse and ultimately succumbed to fatal outcomes. **Conclusion** Propofol abuse represents an under-recognised but potentially fatal occupational hazard among healthcare professionals. Increased awareness, strict drug accountability systems, regular audits and confidential support mechanisms are essential to prevent propofol-related morbidity and mortality.

KEYWORDS

Propofol, Addiction, Substance Abuse, Healthcare Professionals, Neuropharmacology, Gaba-a Receptor, Dopamine, Occupational Hazard.

INTRODUCTION:

Propofol (2,6-diisopropylphenol) is one of the most frequently administered intravenous anaesthetic agents in modern anaesthetic practice. Owing to its rapid onset of action, short duration, antiemetic properties and favourable recovery profile, it has become indispensable for induction and maintenance of anaesthesia, procedural sedation and intensive care unit sedation.

Initially, propofol was believed to possess little abuse potential because of its intravenous route of administration and limited accessibility outside healthcare environments. However, several experimental and clinical studies have demonstrated that subanaesthetic doses may produce pleasurable sensations, relaxation and euphoria, thereby contributing to its reinforcing properties. Consequently, propofol misuse has emerged as a growing concern worldwide, particularly among healthcare professionals.

Anaesthesiologists, nurses, technicians and intensive care personnel constitute a high-risk population owing to their easy access to the drug and familiarity with its administration. Fatal cases involving healthcare workers have increasingly been reported, highlighting the need for greater awareness and preventive strategies.

Recent advances in neuropharmacology have demonstrated that propofol influences mesolimbic reward pathways and modulates dopaminergic neurotransmission, mechanisms that are believed to underlie its addictive potential.

The present report describes two fatal cases of propofol abuse among healthcare professionals and discusses the neuropharmacological mechanisms, occupational risk factors and preventive strategies relevant to anaesthesia practice.

MATERIALS AND METHODS:

A retrospective two-case series with narrative literature review was conducted at a tertiary care teaching hospital. Two fatal cases of propofol abuse encountered over a ten-year period were identified. Available clinical information, occupational background and toxicological findings were analysed.

A comprehensive review of literature regarding propofol addiction, neuropharmacological mechanisms and reported cases among healthcare workers was also undertaken.

Institutional ethical committee approval was obtained. Patient confidentiality and anonymity were maintained.

CASE REPORTS:

Case 1

A 30-year-old male intensive care unit nurse with occupational access to propofol was admitted following suspected propofol misuse. Toxicological analysis revealed a blood propofol concentration of 5.3 µg/ml. No documented history of prior substance abuse was available. Despite hospitalisation and supportive management, the outcome was fatal.

Case 2

A 32-year-old male anaesthesia technician with unrestricted occupational access to anaesthetic drugs developed withdrawal symptoms that culminated in hospitalisation. Toxicological analysis revealed a blood propofol concentration of 4.02 µg/ml in the presence of concomitant sedative agents. There was no documented history of previous substance abuse. Despite treatment, the patient eventually succumbed.

DISCUSSION:

Propofol Abuse Among Healthcare Professionals

Although propofol is widely regarded as a safe anaesthetic agent when administered under appropriate supervision, its abuse potential has increasingly become evident. Healthcare workers constitute the majority of reported cases owing to occupational exposure and unrestricted access.

Several factors predispose healthcare personnel to substance misuse, including stress, burnout, sleep deprivation, emotional exhaustion and easy availability of medications.

Neuropharmacological Basis of Addiction

Propofol exerts its primary action through potentiation of gamma-aminobutyric acid type A (GABA-A) receptors. Enhancement of inhibitory neurotransmission produces sedation and hypnosis.

However, the addictive potential of propofol extends beyond GABAergic activity.

Mesolimbic Dopaminergic Pathway

The mesolimbic reward pathway comprises:

- Ventral tegmental area

- Nucleus accumbens
- Prefrontal cortex

Propofol-induced activation of these pathways results in increased dopamine release and produces:

- Euphoria
- Reward
- Reinforcement
- Craving
- Repeated self-administration

Repeated exposure eventually leads to tolerance and dependence.

Withdrawal and Dependence

Tolerance and withdrawal represent hallmarks of substance dependence. Withdrawal manifestations may include anxiety, insomnia, tremors and psychological distress. The second case in the present report demonstrated withdrawal symptoms, supporting the hypothesis that propofol possesses significant dependence potential.

Fatality Risk

Propofol possesses a narrow therapeutic window. Self-administration outside monitored settings can rapidly lead to:

- Respiratory depression
- Airway obstruction
- Hypoxaemia
- Cardiovascular collapse
- Death

The concomitant use of sedative agents further increases mortality.

Prevention Strategies

Institutional measures should include:

- Strict drug accountability systems.
- Controlled access to propofol stocks.
- Routine drug audits.
- Monitoring of unusual consumption patterns.
- Education and awareness programmes.
- Early recognition of behavioural changes.
- Confidential counselling services.
- Rehabilitation programmes.

STRENGTHS:

This report highlights an under-recognised occupational hazard and integrates clinical observations with current understanding of neuropharmacological mechanisms, thereby providing clinically relevant information for anaesthesiologists and healthcare administrators.

LIMITATIONS:

The absence of detailed clinical records, complete toxicological panels and autopsy findings limits comprehensive analysis. Furthermore, the small sample size precludes estimation of incidence or prevalence. Nevertheless, the fatal outcomes underscore the need for greater awareness and preventive measures.

CONCLUSION:

Propofol abuse represents an under-recognised but potentially fatal occupational hazard among healthcare professionals. Understanding the neuropharmacological basis of addiction and implementing stringent institutional surveillance and support systems are essential to prevent avoidable morbidity and mortality associated with propofol misuse.

ETHICAL APPROVAL:

Institutional Ethics Committee approval was obtained. Patient confidentiality and anonymity were maintained throughout the study.

CONFLICT OF INTEREST:

None.

SOURCE OF FUNDING:

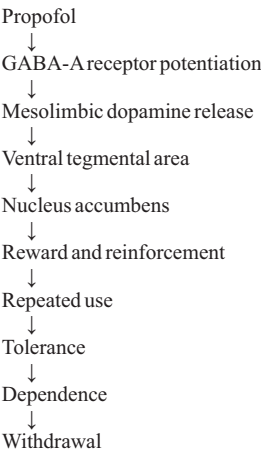
Nil.

TABLE 1: Comparison of the two cases

Variable	Case 1	Case 2
Age	30 years	32 years
Sex	Male	Male

Occupation	ICU Nurse	Anaesthesia Technician
Prior substance abuse	None documented	None documented
Blood propofol concentration	5.3 µg/ml	4.02 µg/ml
Additional sedatives	No	Present
Withdrawal symptoms	Not documented	Present
Outcome	Fatal	Fatal

FIGURE 1: Proposed mechanism of propofol addiction



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