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Research article

HEALTH LITERACY AND AWARENESS OF NURSES AND NURSING STUDENTS ON FENTANYL AND DRUG ABUSE

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SUMMARY

Background: *The rise of synthetic opioids, particularly fentanyl, has intensified the global drug abuse crisis, posing serious challenges to healthcare systems. Nurses and nursing students play a crucial role in prevention, early identification, and emergency management of opioid-related cases. Health Literacy (HL), the ability to access, understand, and use health information, has been proposed as a critical determinant of clinical competence in this context. This study aims to assess the knowledge, awareness, and health literacy of nurses and nursing students in relation to fentanyl and drug abuse, exploring potential associations between HL levels and preparedness to manage substance-related emergencies.*

Subjects and methods: *A national multicenter cross-sectional study was conducted from October 2024 to January 2025, involving 157 participants (nurses and nursing students) across Italy. A structured questionnaire was administered online, covering four domains: sociodemographic information, health literacy (HL), drug addiction knowledge and specific knowledge of fentanyl. Descriptive and inferential statistics were performed using SPSS.*

Results: *Participants demonstrated good overall knowledge about fentanyl clinical use and effects. However, misconceptions were identified - particularly regarding lethal dosages and the inability to detect fentanyl with the senses. Notably, HL scores did not consistently correlate with higher knowledge levels; in some cases, participants with lower HL scores showed better understanding of specific topics such as routes of administration and naloxone use. A significant negative correlation was found between HL and knowledge of drug availability ($r = –0.35$; $p < 0.001$). No significant differences emerged between students and professionals.*

Conclusions: *Findings challenge the assumption that higher HL always predicts better preparedness. Standard HL measures may fail to capture contextual and experiential knowledge essential for managing opioid-related emergencies. Nursing education should incorporate more experiential and clinically focused training on drug abuse, integrating HL as an operational - rather than merely promotional - competency. Further research with larger samples and qualitative methods is recommended.*

Key words: *Health Literacy – fentanyl - nursing education - drug abuse*

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INTRODUCTION

The global escalation of drug abuse, particularly involving synthetic opioids like fentanyl, constitutes a major public health crisis. Between 1999 and 2017, over 700,000 drug-related deaths occurred in the U.S., with a marked increase linked to fentanyl (Centers for Disease Control and Prevention 2018). The WHO estimates that over 15.6 million people use opioids illicitly, including 11 million heroin users (WHO 2009). Fentanyl's extreme potency - 50 to 100 times that of morphine - and rapid action, especially when unknowingly combined with substances like heroin or cocaine, significantly raises the risk of fatal overdose (Carter & Caudill 2020). This risk is further amplified by illicit fentanyl analogues distributed through counterfeit drugs (Kuczyńska et al. 2018). Clinically, fentanyl acts as a full μ-opioid receptor agonist and may cause severe respiratory depression or serotonin syndrome when combined with serotonergic agents (Baldo & Rose 2020). Early illicit drug use can impair brain development and neuroplasticity, leading to long-term cognitive and psychological consequences (WHO 2009; Hamidullah et al. 2020). Psychiatric comorbidities are also frequent among opioid users (Jones et al. 2024).

Although nurses and nursing students are essential in prevention and emergency response, studies reveal significant knowledge gaps regarding opioid pharmacology, overdose recognition and naloxone use (Carter & Caudill 2020; Jones et al. 2024). Integrating structured, evidence-based opioid education into nursing curricula is therefore critical (Carter & Caudill 2020). In this context, health literacy, the ability to obtain, understand, and apply health information, is a critical competency (Kemppainen et al. 2024). Health literacy plays a vital role: higher levels of literacy enhance risk awareness and support informed clinical decision-making (Yang 2022), whereas limited health literacy can hinder preventive efforts and delay timely access to care (McNicol et al. 2024). Despite the growing fentanyl crisis, persistent gaps in healthcare provider preparedness highlight the urgent need to strengthen nurses' education and health literacy (Nosyk et al. 2023).

SUBJECTS AND METHODS

A national multicenter cross-sectional study was conducted between October 2024 and January 2025 on a sample of 157 participants, including registered nurses and undergraduate nursing students. The aim was to assess their knowledge, awareness, and health literacy related to fentanyl and drug abuse. Data were collected through a structured, self-administered questionnaire delivered via Google Forms. The questionnaire included four sections: sociodemographic information (gender, age, nationality, marital status, education level, occupation, place of residence), perceived health literacy (assessing the ease or difficulty of understanding and using health information), knowledge of drug addiction (multiple-choice questions on substances, symptoms, complications, and routes of administration) and fentanyl knowledge (true/false questions on pharmacological properties and clinical risks). Health literacy was assessed using the 12-item Health Literacy Survey 2019 (HLS19-Q12), a validated instrument developed as part of the European Health Literacy Project (Sørensen et al. 2012; Pelikan et al. 2022). For this study, we used the Italian-translated and culturally adapted version, as described in Lorini et al. (2017). The section on general drug addiction knowledge was partially adapted from a validated instrument by Qadhi et al. (2024) and used with permission. Inclusion criteria were being a registered nurse or nursing student, giving informed consent for participation and data use. Exclusion criteria included refusal to participate or lack of eligibility. To ensure data reliability, anonymity was guaranteed, questions were standardized, CAPTCHA verification was used to prevent automated entries, and cookie tracking was implemented to avoid duplicate submissions. Ethical standards were upheld in accordance with EU data protection laws (EU 2018/1725; EU 2016/679). Participation was voluntary and submission of the survey implied informed consent. Due to the nature of the study and anonymized data, no formal ethical approval was required (Italian Ministry of Health Decree 2013). Data were analyzed using SPSS. Descriptive statistics (means, standard deviations, frequencies, percentages) were used, and inferential analysis was conducted using non-parametric tests (Mann–Whitney U, Kruskal–Wallis H) for group comparisons and Spearman's correlation coefficient to explore associations between continuous variables. The choice of non-parametric methods was based on the non-normal distribution of the data. Statistical significance was set at $p < 0.05$.

RESULTS

The questionnaire was completed by 157 participants, including nurses and nursing students from various regions across Italy. Table 1 presents their socio-demographic characteristics. Regarding participants' knowledge of fentanyl, the majority (85.4%, 135/157) correctly identified it as a synthetic opioid commonly found in illicit drugs and counterfeit medications, while 13.9% (22/157) answered incorrectly. When asked whether morphine and heroin are respectively 100 and 50 times more potent than fentanyl - a false statement - 41.4% (65/157) responded "true," reflecting a notable misconception, while 58.6% (92/157) correctly identified the statement as false. A large proportion of respondents (93.0%, 146/157) were aware that fentanyl is also legally prescribed by physicians to manage severe pain, particularly following surgery or in cases of advanced cancer. In addition, 67.5% (106/157) correctly recognized that illegally manufactured fentanyl is available on the drug market in different forms, including liquid and powder, while 32.5% (51/157) were unaware of this fact. Most participants (77.7%, 122/157) understood that fentanyl, when mixed with other substances, cannot be identified by sight, taste, or smell, whereas 22.3% (35/157) mistakenly believed that the senses could detect it. Nearly all respondents (98.7%, 155/157) demonstrated knowledge of the drug's physical and psychological effects, such as confusion, drowsiness, dizziness, nausea, vomiting, pupil size changes, cold and clammy skin, coma and respiratory failure. A total of 66.2% (104/157) correctly responded "false" to the statement that 2 mg of salt converted to fentanyl would not be lethal, recognizing the high toxicity threshold of the substance. However, 33.8% (53/157) answered

Table 1. Participants' sociodemographic characteristics (n=157)

Characteristics	N (%)
Gender	
Male	61 (38.9)
Female	95 (60.5)
Other	1 (0.6)
Age (years)	
18–29	119 (75.8)
30–39	23 (14.6)
40–49	7 (4.4)
50–59	6 (3.8)
>60	2 (1.3)
Nationality	
Italian	153 (97.5)
Albanian	2 (1.3)
Nigerian	1 (0.6)
German	1 (0.6)
Marital Status	
Unmarried	122 (77.7)
Married/Cohabiting	27 (17.2)
Separated/Divorced	8 (5.1)
Level of Education	
Primary school diploma	2 (1.3)
Lower secondary school diploma	78 (49.7)
Upper secondary school diploma	75 (47.8)
Bachelor's degree	2 (1.3)
Occupation	
Nurse	77 (49.0)
Student	80 (51.0)

Table 2. Inferential analysis on fentanyl-related knowledge across sociodemographic groups

Variable	Statistic/measures	Value	Signif. (p value)
Fentanyl is a synthetic opioid found in illicit drugs and counterfeit medications.	Mann-Whitney U Wilcoxon W Z	1208.500 10388.500 -1.429	P=0.153
Morphine and heroin are respectively, 100 and 50 times more potent than fentanyl.	Mann-Whitney U Wilcoxon W Z	2809.000 7087.000 -0.659	P=0.510
Fentanyl is also prescribed by physicians to manage severe pain, particularly following surgery and in advanced-stage cancer.	Mann-Whitney U Wilcoxon W Z	670.000 11401.000 -0.935	P=0.350
Illegally produced fentanyl is available on the drug market in various forms, including liquid and powder.	Mann-Whitney U Wilcoxon W Z	2357.000 8028.000 -1.325	P=0.185
If fentanyl is mixed with another drug the senses can help identify it.	Mann-Whitney U Wilcoxon W Z	2005.000 2635.000 -0.560	P=0.575
The physical and mental effects of fentanyl include confusion, drowsiness, dizziness, nausea, vomiting, changes in pupil size, clammy and pale skin, coma, and respiratory failure.	Mann-Whitney U Wilcoxon W Z	37.500 12127.500 -1.879	P=0.060
It is also referred to as the 'zombie drug'.	Mann-Whitney U Wilcoxon W Z	692.000 11277.000 -1.202	P=0.229
Does Naloxone help counteract fentanyl?	Mann-Whitney U Wilcoxon W Z	776.000 10787.000 -2.087	P=0.037
If I administer naloxone to a friend who has overdosed, can I avoid calling 112?	Mann-Whitney U Wilcoxon W Z	83.500 12173.500 -1.144	P=0.253

Table 3. Inferential analysis on drug addiction knowledge across sociodemographic groups

Variable	Statistic/measures	Value	Signif. (p value)
Which of the following drugs cause addiction? (number of correct answers)	Kruskal-Wallis H Df	22.284 8	P=0.004
Which of the following drugs cause addiction? (number of incorrect answers)	Kruskal-Wallis H Df	19.087 3	P=0.000
Which of the following signs or symptoms are complications of addictive drugs (e.g. opium, heroin, morphine...)? (number of correct answers)	Kruskal-Wallis H Df	4.622 6	P=0.593
Which of the following signs or symptoms are complications of addicted drugs (e.g. opium, heroin, morphine)? (number of incorrect answers)	Kruskal-Wallis H Df	1.520 2	P=0.468
Which of the following complication is caused by stimulants (e.g. ecstasy, shisha)? (number of correct answers)	Kruskal-Wallis H Df	15.138 6	P=0.019
Which of the following complication is caused by stimulants (e.g. ecstasy, shisha)? (number of incorrect answers)	Kruskal-Wallis H Df	0.048 1	P=0.827
What is the short-term complication of drug abuse? (number of correct answers)	Kruskal-Wallis H Df	13.727 7	P=0.056
Which of the following are long-term complications of drug use? (number of incorrect answers)	Kruskal-Wallis H Df	3.210 2	P=0.201
In what forms are drugs available? (number of correct answers)	Kruskal-Wallis H Df	33.812 8	P=0.000
Smoking status	Mann-Whitney U Wilcoxon W Z	2979.000 7257.000 -0.400	P=0.968
Have you ever received information about drug addiction?	Mann-Whitney U Wilcoxon W Z	962.000 10832.000 -1.316	P=0.188

Note: Mann–Whitney U test used for two-group comparisons; Kruskal–Wallis H test used for comparisons involving more than two groups

"true," indicating a lack of awareness regarding the lethal potential of minimal doses. A strong majority (92.4%, 145/157) correctly identified fentanyl as being referred to as the "zombie drug," a nickname associated with its potent neurological effects, while 7.6% (12/157) did not recognize the term. Awareness of naloxone's therapeutic use was high, with 89.8% (141/157) correctly acknowledging that it can counteract fentanyl's effects, although 10.2% (16/157) were unaware of this. Finally, when asked if administering naloxone to a person experiencing an overdose eliminates the need to contact emergency services, nearly all respondents (98.7%, 155/157) correctly answered "false," acknowledging the continued need for medical assistance. Only two participants (1.3%) mistakenly believed that calling emergency services was unnecessary. No statistically significant differences were found between sociodemographic variables (gender, age, education level, occupation) and questionnaire scores.

Spearman's correlation analysis revealed several significant associations. A significant negative relationship between knowledge of drug availability and trust in family health advice ($r = –0.16$; $p = 0.041$). A strong positive correlation was found between knowledge of addictive medications and knowledge of drug forms ($r = 0.49$; $p < 0.001$). A significant negative correlation emerged between general health literacy and knowledge of drug availability ($r = –0.35$; $p < 0.001$). A positive correlation was also observed between awareness of fentanyl effects and knowledge of its long-term complications ($r = 0.42$; $p < 0.001$). Statistical comparisons in Tables 2 and 3 were based on profession, smoking status, education level and previous exposure to drug-related education. Non-parametric tests (Mann–Whitney or Kruskal–Wallis) were selected according to group size.

DISCUSSION

This study investigated the knowledge and awareness of nurses and nursing students regarding drug addiction and fentanyl, with a specific focus on Health Literacy (HL) and its impact on clinical preparedness. Four core domains were assessed through a structured questionnaire: socio-demographics, self-reported HL, general knowledge on drug addiction and fentanyl-specific knowledge. The sample consisted mainly of young females, evenly divided between students and professionals, enabling comparisons between academic and clinical experience.

Overall, HL levels were not adequate (mean score 19/25). While participants demonstrated some functional literacy, interactive and critical literacy - essential for clinical judgment and safe opioid management - were insufficient. This finding aligns with previous studies suggesting that healthcare professionals often display limited competencies in applying, appraising, and communicating health information in practice (Sun et al. 2025; Nutbeam 2008; Geboers et al. 2015).

Knowledge regarding drug addiction was moderate (mean 8.33/13), with particular gaps in recognizing complications, differentiating substances, and understanding less common administration routes. Importantly, higher HL scores did not consistently translate into more accurate knowledge of fentanyl pharmacology, confirming that general literacy metrics may fail to capture the applied competencies required for emergency management (Compton & Blacher 2020; Meadows et al. 2021). Misconceptions about fentanyl toxicity, overdose recognition, and naloxone use are especially concerning in the current opioid crisis.

These results reinforce the urgent call for more targeted educational interventions (Aronowitz et al. 2021). Nursing curricula should integrate experiential and simulation-based modules, alongside supervised clinical observation, to bridge the gap between theoretical understanding and practical decision-making. Training should emphasize both technical proficiency and relational competence, preparing professionals to respond effectively to drug-related emergencies (Smith & Jones 2022; Williams et al. 2021).

CONCLUSIONS

This study highlights significant gaps in the health literacy and knowledge of nurses and nursing students regarding fentanyl and drug abuse. Despite some functional literacy, overall HL levels were inadequate, particularly in domains related to critical appraisal and the application of knowledge in practice. These deficits directly influence the recognition of overdose risks, the correct use of naloxone, and the ability to manage clinical emergencies.

The findings underscore the urgent need to strengthen nursing education through practical, clinically oriented approaches. Incorporating simulation, case-based learning, and supervised clinical exposure into training programs may improve not only knowledge but also the capacity to act appropriately in high-risk situations. Future research should expand to larger and more diverse samples, employing longitudinal designs to assess the long-term impact of targeted HL interventions on clinical performance.

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Contribution of individual authors:

Francesco Pastore, Fabia Basho, Emanuela Domenicone & Larissa Domeneck: conceptualization,data collection manuscript preparation, writing, bibliographic research and statistical analysis.

Antonella Litta: critical revision of the manuscript.

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