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ASSESSMENT OF MEDICAL DOCTORS' KNOWLEDGE OF NEW PSYCHOACTIVE SUBSTANCES AND THEIR NEUROBEHAVIOURAL EFFECTS

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ABSTRACT

New Psychoactive Substances (NPS), also known as designer drugs, pose significant public health risks due to their potent psychoactive properties and potential neurobehavioural effects. Medical doctors play a crucial role in identifying and addressing the health risks associated with NPS use. This study assessed medical doctors' knowledge of NPS and their neurobehavioral effects. A cross-sectional online survey of licensed medical doctors was conducted, revealing varying levels of awareness and knowledge regarding NPS. While respondents showed familiarity with NPS terminology and street names, gaps existed, particularly concerning specific NPS categories. This underscores the importance of enhancing medical professionals' understanding of NPS to ensure comprehensive patient care and informed treatment decisions.

Keywords: Medical Doctors, Designer drugs, New Psychoactive Substances (NPS), Neurobehavioral Effects, Familiarity

INTRODUCTION

New psychoactive substances (NPS) are a complex and varied group of drugs often known as 'Novel Psychoactive Substances', 'Designer drugs', or 'Synthetic Drugs' (Feng et al., 2017; Gilani, 2016; United Nations Office on Drugs and Crime, 2020, p. 2). The UNODC defined NPS as “substances of abuse,

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either in a pure form or a preparation, that are not controlled by the 1961 Single Convention on Narcotic Drugs or the 1971 Convention on Psychotropic Substances, but which may pose a public health threat" (United Nations Office On Drugs and Crime, 2020, p. 2). The UNODC further noted that the term "new" does not necessarily refer to new inventions — several NPS were first synthesized decades ago — but to substances that have recently become available on the market"(United Nations Office on Drugs and Crime, 2020, p. 2).

NPS has evolved and multiplied over the years, with the UNODC declaring over 900 NPS as of 2019, from about 600 in 2015 (Feng et al., 2017; United Nations Office on Drugs and Crime, 2020). This high number, as well as the rapid evolution, make these substances a critical challenge to the government, the general public as well as clinical, and scientific communities (Gilani, 2016; Shafi et al., 2020).

NPS includes a wide range of chemical structures, all of which have the potential to produce different neurobehavioral effects (Shafi et al., 2020). Studies by Shafi et al and Gilani have shown that not only is there a wide range of chemical compounds, but products labeled with the same name may also contain different compounds, sometimes with several compounds in one product (Gilani, 2016; Shafi et al., 2020). The neuropsychological effects might range from euphoria to serious cognitive impairment and life-threatening symptoms (Abdulrahim & Bowden-Jones, 2015; Gilani, 2016; Kronstrand et al., 2018). Consequently, NPS users often experience unpredictable outcomes, including acute intoxication, overdose, and other mental health issues (Abdulrahim D. & Bowden-Jones O., 2015; Kronstrand et al., 2018).

Medical doctors play a key role in diagnosing and treating people with substance use problems (Miller & Sheppard, 1999). Managing a patient who has used NPS may be quite challenging and not straightforward for clinicians (Aguirre-Molina & Gorman, 2003; Awuchi et al., 2023; Shafi et al., 2020). This is due in part to the wide array of chemical structures and the constantly changing formulations of the substances (Shafi et al., 2020; Sherri L. Kacinko & Donna M. Papsun, n.d.). Furthermore, regular toxicology screens may not be well suited to detect these NPS, thus, treating clinicians may not know which guideline to reference (Grafinger et al., 2020; Sherri L. Kacinko & Donna M. Papsun, n.d.). Owing to the above, unraveling the exact neurobehavioral effect(s) of the substance(s) becomes a bit problematic (Feng et al., 2017; Gilani, 2016; Grafinger et al., 2020; Kronstrand et al., 2018). Unfortunately, less is known about the level of medical doctors' knowledge of NPS and its neurobehavioral effects, particularly within the context of Uyo, Nigeria. To the best of our knowledge, no prior published studies have undertaken this assessment among medical doctors in this region. However, this absence of data does not imply a low prevalence of NPS utilization in Uyo or the broader

African continent. Notably, recent studies by Dumbili et al. in Nigeria and Okafor et al. in Calabar revealed escalating rates of NPS utilization, with a diverse array of substances, including indigenous varieties, identified among patient populations (Dumbili et al., 2021; Okafor C. J. et al., 2022). Similarly, research conducted in Kenya by Kahuthia-Gathu documented the emergence of over forty new NPS (Kahuthia-Gathu et al., 2013). Comparable trends have also been observed in South Africa and other regions of Africa (Kahuthia-Gathu et al., 2013; Onaolapo et al., 2022). Importantly, a high level of knowledge of NPS and their neurobehavioral effects among medical doctors will have great clinical implications particularly as regards good clinical outcomes in the medical management of the patients who use NPS in our environment. Therefore, this study aimed to assess medical doctors' knowledge of NPS and its neurobehavioral effects. Also, our findings will be compared with existing relevant literature. This understanding is crucial to developing effective educational interventions, improving clinical practice, and promoting patient safety in the medical management of NPS and their neurobehavioral effects.

METHOD

Study design: This study was a cross-sectional survey conducted among medical doctors from diverse specialties and geographic regions, both within Nigeria and among Nigerian medical professionals residing in various countries abroad, encompassing the Nigerian diaspora. The selection of participants from varied geographical locations aimed to enrich the depth of research findings, enable comparative analyses and foster a comprehensive understanding of the investigated topic. The study used a survey instrument that contained both closed and open-ended questions to collect data. Data analysis involved descriptive statistical analysis and thematic (qualitative) analysis.

Study instrument: We designed a survey instrument that was pre-tested by two independent reviewers who found that the questionnaire was good enough and made few corrections to it which include rephrasing of a question and adding a question to the questionnaire. The questionnaire comprised 24 questions subdivided into six sections. Section one contained an introduction to the survey, including an explanation of the study objective. The other sections, in chronological order, contained questions that assessed sociodemographic information; familiarity with NPS terminology, common street names and categories of NPS; neurobehavioral effects of NPS; management-related issues (e.g., clinical encounters involving patients who disclosed their NPS use and their confidence in addressing NPS-related health concerns); and conclusion.

Sampling and data collection Procedures: The respondents were recruited through convenience sampling via an online Google survey form and the link was shared across medical doctors' online groups (i.e., professional medical

associations) on the WhatsApp social media platform. The inclusion criteria were being a licensed medical doctor and consent to participate in the study. Data collection went on for two (2) weeks. The survey was launched on the 25th of July 2023 and the dataset used in this study was extracted on the 8th of August 2023.

Data analysis

Descriptive Analysis: The data analysis was done using Google Sheets. Frequencies and percentages were computed for most of the questions including those assessing demographic information, questions testing familiarity with the terminology, common street names and categories of NPS, knowledge of neurobehavioral effects, etc.

Thematic Analysis: For open-ended questions, qualitative thematic analysis was carried out to identify common themes in respondents' responses. Initially, responses were familiarized with to gain an understanding of their content. Subsequently, an open coding approach was utilized to assign descriptive codes to relevant segments of the data. These codes were then collated to identify overarching themes that emerged from the data. Through iterative review and refinement of these themes, a comprehensive understanding of the dataset was achieved. Ultimately, conclusions were drawn based on the synthesized themes, providing valuable insights into the perspectives and experiences conveyed by the respondents.

Ethical considerations: Formal ethics approval was not needed because the research entailed no harm to participants. However, ethical guidelines and principles outlined in the Declaration of Helsinki were adhered to. Before the respondents saw the questionnaire page, a thorough explanation of the research's goals and objectives were given to them. Informed consent was obtained from the respondents and the confidentiality of the information they provided was assured. None of the respondents was compelled in any form nor given survey inducement to complete the online survey questionnaire. The authors also declared that all the respondents were fully anonymous. The entire cost of this research was borne by the authors.

RESULTS

A total number of 101 respondents filled out the survey form within the study period. More males (65.9%) responded than females (33%), with a male-to-female ratio of 2:1. The age range of respondents was 29 to 63 years, with a mean age of 38 ± 6.59 years. The respondents comprised almost entirely (99%) of practicing medical doctors from Nigeria, practicing in Nigeria (95%) and in the diaspora (5%). Of those practicing in Nigeria, approximately 84% work in teaching hospitals or other federal government-owned health facilities while the rest are in private facilities, primary health centers, general hospitals, and educational institutions. The majority of the respondents have between 5 to 20 years of experience in medical practice (Table 1).

The level of familiarity with the term NPS and the common street names used to describe them, as reported by the respondents, are shown in Table 2. More than half of the respondents identified the statements that correctly described NPS as psychoactive substances that recently became available in the market (approximately 54%) as well as those that are designed to mimic established psychoactive substances (55%) (Table 2).

Table 1: Frequency distribution table displaying the respondents' sociodemographic data

Characteristics	Frequency	Percentage (%)
	Gender	
Male	66	65.35
Female	34	33.66
Prefer not to say	1	0.99
Total	101	100
	Age	
Age categories		
< 30	2	1.98
30 to 39	65	64.36
40 to 49	25	24.75
50 to 59	5	4.95
= 60	2	1.98
Missing	2	1.98
Total	101	100
	Years of experience as a doctor	
Duration (in years)		
< 5	2	1.98
5 to 10	54	53.47
10 to 20	35	34.65
> 20	10	9.9
	Are you currently practicing?	
Yes	100	99.01
No	0	0
Prefer not to say	1	0.99
Total	101	100
	Place of current practice	
Teaching hospital/other federal govt. Institution	85	84.16
Private health facility	7	6.93
Educational institutions	3	2.97
Primary health center/general hospital	4	3.96
Others	2	1.98
	Country of residence/practice	
Nigeria	96	95.05
Diaspora	5	4.95
Total	101	100

Table 2: Frequency distribution table displaying respondents' familiarity with NPS

Degrees of agreement	I am familiar with the term NPS		I am familiar with common street names of NPS	
Answer	Frequency	Percentage (%)	Frequency	Percentage (%)
Strongly agree	20	19.8	11	10.9
Agree	37	36.6	51	50.5
Neutral	20	19.8	17	16.8
Disagree	19	18.8	18	17.8
Strongly disagree	5	5	4	4
	Statements that describe NPS			
The statements	Frequency		Percentage (%)	
Newly invented psychoactive substances (PS)	28		27.7	
Newly discovered psychoactive substances	38		37.6	
Recently available psychoactive substances in the market	54		53.5	
PS designed to mimic established PS	56		55.4	
Not sure	1		0.99	
	Classes of NPS			
The classes	Frequency		Percentage (%)	
Synthetic cannabinoids	63		62.4	
Synthetic cathinones	38		37.6	
Synthetic hallucinogens	41		40.6	
Synthetic opioids	45		44.6	
Designer benzodiazepines	33		32.7	
Not sure	29		28.7	
Others	3		3.0	

Regarding the different categories of NPS, the respondents were most familiar with synthetic cannabinoids (62%) and least familiar (33%) with designer benzodiazepines. Some (29%) of the respondents were unsure of the classes of NPS (Table 2). It should be noted that the first 20 survey respondents did not respond to the question requiring specific names of NPS, because this question was added to the survey form after it had been disseminated. Interestingly, 91.4% (81) of the respondents responded to the question that required them to list some street names of substances known to them. A total of 82.7% of the responses given were correct, while 2.5% were

wrong, and the remaining 14.8% were either not sure or had no idea. The respondents gave some unconventional street names e.g. eye shiner, pawpaw leaves, dried human and lizard dung, gbaja,, and a combination of cough syrup and tom-tom sweets. The most popular means by which users obtain substances for consumption according to the respondents was through street dealers (80.2%) while online marketplaces (25.7%) and smoke shops (25.7%) were the least popular sources (Figure 1).

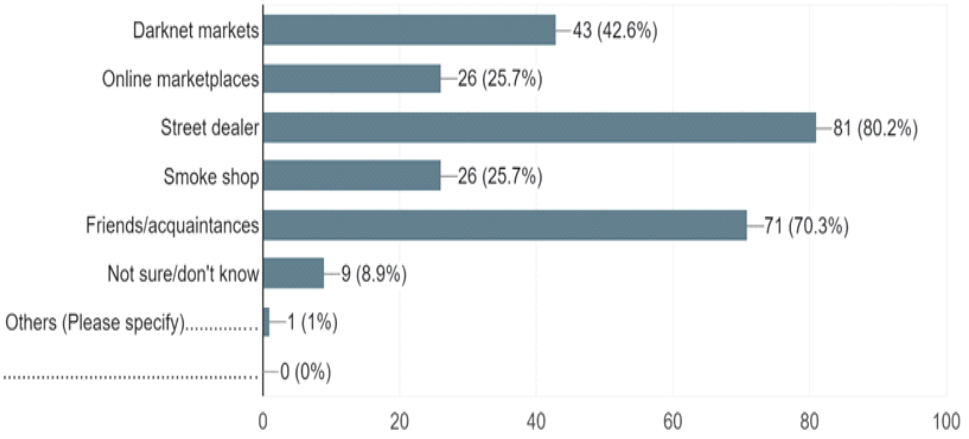

Figure 1: A bar chart showing the frequency distribution of respondents' knowledge of how drug users obtain NPS

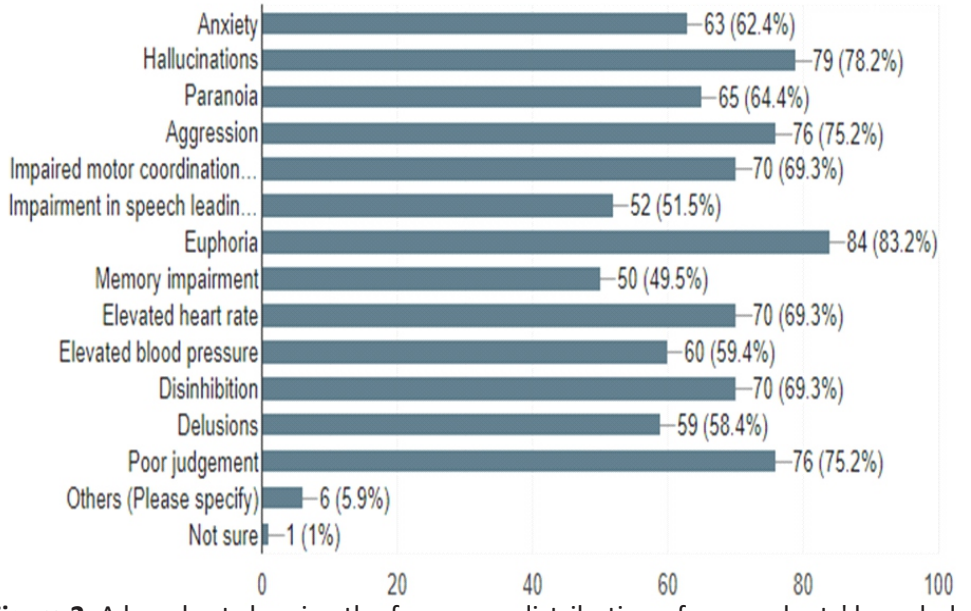

Figure 2: A bar chart showing the frequency distribution of respondents' knowledge of short-term neurobehavioral effects of NPS

The respondents were generally knowledgeable about the short-term neurobehavioral effects of NPS. The most popular short-term effect identified by respondents was euphoria (83.2%) followed by hallucinations (78.2%), poor judgment (75.2%), and memory impairment (49.5%) (Figure 2). Psychotic illness was the long-term effect of substance use that most (90.1%) respondents were familiar with. On the other hand, only 1% of the respondents opined that insomnia could be a long-term effect, while another 1% believed that engaging in criminal activities could be a long-term consequence of using psychoactive substances. (Figure 3). Most of the respondents opined that oral ingestion (71.3%), inhalation (81.2%), injection (56.4%), and smoking (76.2%) are usual routes of administration of NPS (Figure 4).

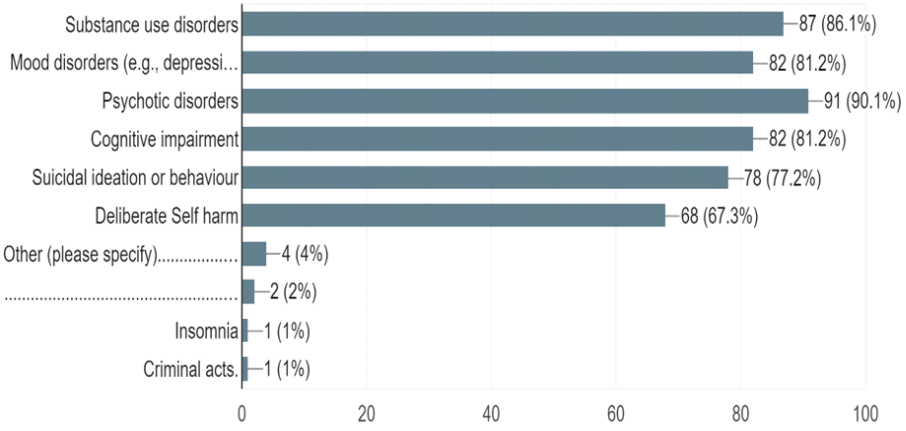

Figure 3: A bar chart showing the frequency distribution of respondents' knowledge of the long-term effects of NPS

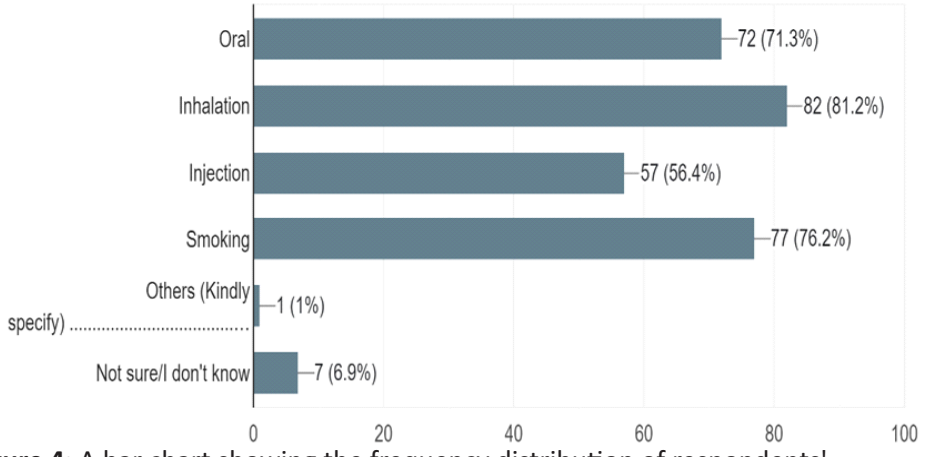

Figure 4: A bar chart showing the frequency distribution of respondents' knowledge of routes of administration of NPS

Some of the respondents (38.6%) stated that they rarely (once or twice a year) encountering patients in their practice who used NPS. This was closely followed by 35.6% of the respondents who reported occasionally (a few times a year) seeing patients who had used NPS, 20.8% who regularly (several times a month) see such patients. Only 5% said that they frequently (several times a week) encounter such patients.

The respondents expressed different levels of confidence in their ability to identify NPS-related health issues in their patients ranging from not confident at all (17.85%) to very confident (25.7%). Also, 60.8% of the respondents opined that they do not feel that they are adequately trained to address NPS-related health issues, but 27.7% felt they were adequately trained while 11.9% were unsure. The majority of the doctors said that they typically manage patients who disclose NPS use by giving them non-judgmental counseling (86.1%), referring them to a substance abuse specialist (84.2%), while 2% stated that they would report such a patient to the police.

The responders kept abreast with knowledge of NPS through continuing medical education, professional conferences, webinars, etc.

DISCUSSION

This study aimed to provide an evaluation of medical doctors' understanding of new psychoactive substances (NPS) and their neurobehavioral consequences. Many respondents were familiar with the term NPS, were able to give common street names of NPS, even the unconventional ones, and were largely conversant with the short and long-term neurobehavioral effects of NPS. The majority of respondents practicing in teaching hospitals and federal government-owned health facilities indicate the potential influence of their working environment on their exposure to diverse patient populations.

The respondents' demographics show a diverse representation of medical professionals, with a male predominance, which is consistent with earlier studies indicating a higher frequency of men in the medical system, although this trend has begun to change in some countries (Frédéric Michas, 2022). The vast majority of respondents work in Nigeria, mostly at federal government-owned teaching hospitals or other healthcare institutions, indicating a sizeable sample with potential influence over healthcare policies and clinical practice within their respective domains. The mean age of 38 ± 6.59 years of respondents matches the demographic profile of experienced medical doctors in Nigeria as shown in a previous study (Fawibe et al., 2017). This lends credibility to the study findings.

The findings on medical doctors' knowledge of the word "NPS" and common street names show that there is a high-level of awareness among the respondents. A fundamental understanding of NPS nature is highlighted by the identification of NPS as recently available psychoactive drugs and their function in mimicking well-established psychoactive agents.

Synthetic cannabinoids were found to be the most well-known NPS category, which is consistent with earlier studies (Gilani, 2016; Shafi et al., 2020). A recent review showed that synthetic cannabinoids are the first formally reported, largest, and most structurally diverse group of NPS (Shafi et al., 2020). The study also shows gap in knowledge study also finds gaps in knowledge of some NPS categories, particularly designer benzodiazepines, and a significant proportion of respondents who were unsure of the NPS classes. This reveals an area where teaching programs aimed at improving knowledge NPS and their classifications are needed. The complexity and quick evolution of these drugs can explain the fact that over one-third of the respondents weren't sure about the NPS classifications. The identification of unconventional street names buttresses the findings from previous local studies that revealed some unconventional/non-classical NPS used in Nigeria (Dumbili et al., 2021; Okafor C. J. et al., 2022). It also emphasizes how crucial it is to stay current with street slang because doing so could help medical doctors identify probable NPS usage among patients as well as advance clinical and epidemiological research on NPS.

The respondents' understanding of the methods of administering NPS, including oral ingestion, inhalation, injection, and smoking, reveals a good knowledge of the practical issues regarding NPS use. The finding that street dealers are the main source of NPS for users is consistent with the findings from other studies (Gilani, 2016; Hill, 2020; van Amsterdam et al., 2023). In the United Kingdom, the fact that the main source of NPS for drug users is street dealers was said to have been due to the Psychoactive Substance Act 2016, but in Nigeria, this is likely due to the comparatively limited use of online shopping platforms (Haden et al., 2017; Hill, 2020; Psychoactive Substances Act 2016 - GOV.UK, n.d.). Recognizing street dealers as the main source of NPS for users highlights the importance of addressing the drug market and emphasizing public health measures to curb distribution. It is impressive that the respondents were aware of the short-term neurobehavioral effects of NPS, such as euphoria, hallucinations, and poor judgment, although some studies have shown that these effects need to be studied more because of the complex nature of NPS (Dumbili et al., 2021; Feng et al., 2017; Shafi et al., 2020).

The respondents' awareness of psychotic illness as a potential long-term effect of NPS aligns with existing knowledge about the mental health risks associated with substance use (David Semple & Roger Smyth, 2013; First & American Psychiatric Association, n.d.). It is also possible that this awareness is due in part to, or reinforced by, the prevailing myth in Nigeria that drug use is the cause of mental illness (Adewuya & Makanjuola, 2008). The low level of awareness of criminal activity and insomnia as potential long-term effects point to a need for further awareness and education.

The reported frequency of encountering patients using NPS varies,

with a significant portion of respondents indicating these differences occasional encounters. Patient groups, geographic locations, and specific clinical practice environments may vary, which could account for these differences. Inability to identify clinical manifestations of NPS may also possibly account for the low frequency of encounters. This is buttressed by the fact that few respondents expressed confidence in their ability to identify health-related NPS effects in patients. This could be a result of the fact that close to two-thirds of the respondents felt that they had not been adequately trained to manage NPS-related health problems.

The main limitation of this study is that the research questions that assessed knowledge of neurobehavioral effects were not phrased to show a connection between specific substances and their potential neurobehavioral effects. This points to the need for more in-depth studies to more accurately gauge knowledge of psychoactive substances and their consequences on mental health. In addition, the survey initially didn't include a question about specific names of NPS. Consequently, the first 20 respondents didn't get to answer this question. As a result, the responses on specific NPS names may not fully represent the entire sample since they were only obtained from a subset of respondents. Moreover, the number of participants in the diaspora were too few to allow a reasonable comparison of the experience of medical doctors in Nigeria and the diaspora. Further, laboratory research using animal subjects are needed to better understand the neurobehavioral effects of locally available NPS.

Conclusion

This study sheds light on medical doctors' knowledge of New Psychoactive Substances (NPS) and their neurobehavioral effects. Although the respondents show a basic comprehension of NPS, there are knowledge and confidence gaps, especially with regard to some NPS categories and long-term consequences. The findings highlight the critical need for focused education and training to give medical doctors the knowledge necessary to efficiently detect, manage, and educate patients about health-related dangers connected to NPS. Medical doctors could make a significant contribution to early intervention, patient care, and public health initiatives aiming to address NPS use and related harms.

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