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Knowledge, Attitudes, Practices, and Perceived Quality of Life Among Adults Receiving Intravenous Nicotinamide Adenine Dinucleotide Therapy in Lebanon: A Cross-Sectional Study

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Abstract

Background

Intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy has gained increasing popularity despite limited clinical evidence supporting its effectiveness. This study assessed knowledge, attitudes, and practices (KAP) regarding IV NAD^+ therapy, perceived quality of life, and factors associated with selected treatment-related perceptions and intention to continue IV NAD^+ therapy.

Methods

A cross-sectional study was conducted in 2025 among 100 adults receiving IV NAD^+ therapy in physician-owned private clinics across Lebanon. The questionnaire included researcher-developed KAP items and selected quality-of-life items adapted from the SF-36 Health Survey. The questionnaire underwent forward–backward translation into Arabic. Descriptive statistics and Fisher's exact test were used for data analysis.

Results

The largest proportion of participants was aged 36–45 years (34%), and 65% were women. Moderate knowledge of IV NAD^+ therapy was reported by 47% of participants. Sponsored social media (30%), healthcare professionals (29%), and family or friends (24%) were the primary sources of information, whereas only 4% reported scientific literature. Most participants perceived IV NAD^+ therapy as moderately safe (49%), and 84% reported no adverse effects. Participants commonly reported favorable perceived health-related outcomes following IV NAD^+ therapy, including better overall health than before therapy (75%), feeling full of energy at least a good bit of the time (73%), and improved mood (65%). Greater knowledge was significantly associated with belief in the age-related benefits of IV NAD^+ therapy ($p < 0.001$) and intention to continue therapy ($p = 0.019$).

Conclusion

Adults residing in Lebanon receiving IV NAD^+ therapy generally reported favorable perceptions regarding treatment safety and health-related well-being; however, information was frequently obtained from non-scientific sources. These findings reflect patient perceptions rather than objective clinical effectiveness. Prospective studies using validated outcome measures and objective clinical endpoints are warranted to establish the effectiveness and safety of IV NAD^+ therapy.

1. Background

Nicotinamide adenine dinucleotide (NAD^+) is an essential coenzyme involved in cellular energy metabolism and oxidation–reduction reactions. It serves as a cofactor for numerous enzymes that regulate mitochondrial function, DNA repair, cellular signaling, and metabolic homeostasis (1, 2). Age-related declines in intracellular NAD^+ levels have been associated with several chronic conditions, including neurodegenerative disorders, metabolic diseases, and cardiovascular diseases, leading to growing interest in therapeutic strategies aimed at restoring NAD^+ availability (3, 4) .

Several pharmacological and nutritional approaches have been investigated to increase NAD^+ levels, including supplementation with NAD^+ precursors, inhibition of NAD^+-consuming enzymes, and direct NAD^+ administration (5). More recently, intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy has gained increasing popularity in private wellness clinics and complementary medicine settings, where it is marketed for healthy aging, fatigue, cognitive enhancement, pain management, addiction recovery, and general well-being. Despite its increasing clinical use and commercial availability, robust clinical evidence supporting its effectiveness remains limited, and standardized treatment protocols have yet to be established (5, 6). The rapid adoption of IV NAD^+ therapy despite limited high-quality clinical evidence highlights the importance of understanding patients' knowledge, expectations, and experiences with this emerging intervention.

Although experimental and early clinical studies have suggested that NAD^+ supplementation may improve mitochondrial function and exert beneficial effects on musculoskeletal health, fertility, metabolic disorders, and inflammatory pathways, the current evidence remains inconclusive (3, 6). Most published studies are preclinical or involve small clinical samples, limiting the generalizability of their findings. Consequently, further well-designed clinical studies are required before definitive conclusions can be drawn regarding the effectiveness and safety of IV NAD^+ therapy (5) .

As the use of complementary and wellness therapies continues to expand, understanding patients' knowledge, attitudes, and practices (KAP) has become increasingly important. KAP studies can identify gaps in awareness, characterize treatment-related perceptions and behaviors, and inform patient-education strategies and future research (7). This is particularly relevant for emerging therapies with limited clinical evidence, for which patients may obtain information from a range of professional and non-professional sources.

Quality of life (QoL) is an important patient-reported outcome that reflects individuals' perceptions of their physical, psychological, and social well-being. In complementary and wellness medicine, perceived improvements in QoL frequently influence patients' decisions to initiate and continue treatment, even when objective clinical evidence remains limited. Therefore, evaluating patients' perceived QoL may provide valuable insight into their treatment experiences, expectations, and factors influencing continued use of IV NAD^+ therapy.

In Lebanon, IV NAD^+ therapy has become increasingly available through physician-owned wellness clinics and is actively promoted through healthcare professionals, wellness providers, and digital media. However, despite its growing popularity, to our knowledge, there is limited published evidence examining

the knowledge, attitudes, practices, and perceived quality of life of adults residing in Lebanon receiving IV NAD^+ therapy. Understanding these aspects is particularly important because patients' perceptions and expectations may shape their treatment decisions and future willingness to continue therapies whose clinical effectiveness has not yet been firmly established.

This study addresses an important gap in the Lebanese literature regarding patients' perceptions and use of IV NAD^+ therapy. Accordingly, it aimed to assess knowledge, attitudes, and practices regarding IV NAD^+ therapy among adults residing in Lebanon receiving treatment, evaluate perceived changes in quality of life, and identify factors associated with selected perceptions and treatment-related outcomes, including intention to continue IV NAD^+ therapy. Furthermore, this study provides the first patient-centered assessment of IV NAD^+ therapy in Lebanon and may inform future clinical research, patient education, and evidence-based decision-making regarding its use.

2. Methods

2.1 Aim

This study addresses an important gap in the Lebanese literature regarding patients' perceptions and use of IV NAD^+ therapy. Accordingly, it aimed to assess knowledge, attitudes, and practices regarding IV NAD^+ therapy among adults residing in Lebanon receiving treatment, evaluate perceived changes in quality of life, and identify factors associated with selected perceptions and treatment-related outcomes, including intention to continue IV NAD^+ therapy. Furthermore, this study provides the first patient-centered assessment of IV NAD^+ therapy in Lebanon and may inform future clinical research, patient education, and evidence-based decision-making regarding its use.

2.2 Study design

A cross-sectional study was conducted from July to October 2025 among adults residing in Lebanon receiving intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy in physician-owned private wellness clinics across Lebanon. The study assessed participants' knowledge, attitudes, and practices (KAP) regarding IV NAD^+ therapy, evaluated perceived changes in quality-of-life following treatment, and examined sociodemographic factors and other factors associated with selected treatment-related perceptions and outcomes related to IV NAD^+ therapy.

2.3 Study setting and participants

The study was conducted in physician-owned private wellness clinics offering intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy across Lebanon. Eligible participants were adults, residing in Lebanon, aged 18 years or older who were receiving IV NAD^+ therapy at the participating clinics during the study period. Pregnant and breastfeeding women were excluded from participation.

2.4 Sample size

Based on estimates provided by clinics offering IV NAD^+ therapy, approximately 300 individuals were receiving this therapy in Lebanon during the study period. Given the exploratory nature of the study, the limited number of eligible patients, and the feasibility of recruitment across participating clinics, a target sample of 100 participants was selected. All 100 participants who completed the questionnaire were included in the final analysis.

2.5 Sampling technique

A convenience sampling method was employed to recruit participants from physician-owned private wellness clinics offering intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy across the Lebanese governorates. Physicians practicing in participating clinics were invited to assist with participant recruitment. Eligible patients attending the clinics during the study period were informed about the study and invited to participate on a voluntary basis. Individuals who agreed to participate provided informed consent before completing the questionnaire. Recruitment continued until the target sample size was achieved.

1. **Questionnaire development**

2.6 Questionnaire Development

The questionnaire was specifically developed by the research team for the present study following a comprehensive review of the literature on intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy, as no standardized instrument assessing knowledge, attitudes, and practices (KAP) regarding IV NAD^+ therapy was available. The questionnaire comprised 38 items organized into five sections covering sociodemographic and clinical characteristics, knowledge, attitudes, practices, and perceived quality of life.

The questionnaire included multiple-choice questions, multiple-response questions, Likert-scale questions, dichotomous (yes/no) questions, numeric rating scales, and open-ended questions. The knowledge, attitudes, and practices items were developed specifically for this study, whereas selected quality-of-life items were adapted from the previously published Short Form-36 Health Survey (SF-36) (8). These quality-of-life items were analyzed individually rather than as a validated SF-36 composite score.

The English-language version of the questionnaire is provided as Supplementary File 1.

2.7 Variables and response classification

The primary study variables included participants' knowledge, attitudes, practices (KAP), and perceived quality of life (QoL) regarding intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy.

Knowledge was assessed using three domains: participants' self-reported level of understanding of IV NAD^+ therapy, their primary sources of information, and their perceived beliefs regarding the benefits of

IV NAD^+ therapy for age-related conditions. Responses were summarized descriptively according to the predefined response categories.

Attitude was assessed using questions evaluating participants' perceptions of the safety of IV NAD^+ therapy and their beliefs regarding its potential risks. Responses were summarized descriptively according to the predefined response categories.

Practice was evaluated through questions exploring participants' use of IV NAD^+ therapy, including treatment duration, number of treatment sessions, indications for therapy, concomitant medication use, perceived improvement in their initial medical condition, adverse effects, and intention to continue treatment. Responses were summarized descriptively according to the predefined response categories.

Perceived quality of life (QoL) was assessed using selected quality-of-life items based on the Short Form-36 Health Survey (SF-36). These items evaluated participants' perceived physical and psychological well-being following IV NAD^+ therapy and were analyzed individually rather than as a validated SF-36 composite score.

2.8 Translation

The questionnaire was initially developed in English and subsequently translated into Arabic using a forward–backward translation process to ensure linguistic accuracy and conceptual equivalence. The forward translation from English to Arabic and the backward translation from Arabic to English were performed independently by bilingual translators. Any discrepancies identified during the translation process were discussed and resolved by the research team to produce the final Arabic version of the questionnaire. Both the English and Arabic versions were available, allowing participants to complete the questionnaire in their preferred language.

2.9 Pilot testing

Prior to the main study, the questionnaire was pilot tested in 2025 among 12 adults receiving IV NAD^+ therapy from physician-owned private wellness clinics located in different Lebanese governorates. The pilot study was conducted to evaluate the clarity, comprehensibility, and overall acceptability of the questionnaire. Participants were invited to provide feedback regarding the wording, structure, and comprehensibility of the questions. Based on their feedback, minor modifications were made to improve the clarity and organization of the questionnaire before its administration in the main study. Data obtained during the pilot study were not included in the final analysis.

2.10 Data collection

Data were collected in 2025 using a structured questionnaire administered in physician-owned private wellness clinics across Lebanon. Eligible participants were invited to participate during their clinic visits and, after providing written informed consent, completed the questionnaire either electronically using a Google Forms link or in paper format according to their preference.

For electronic data collection, the questionnaire link was shared with eligible participants through their treating physicians using commonly used communication applications. For paper-based data collection, printed questionnaires were completed by participants during their IV NAD^+ therapy sessions at the participating clinics and were securely stored until collected by the research team.

Responses submitted electronically were automatically stored in a secure Google Forms database. Paper questionnaires were entered into a Microsoft Excel spreadsheet by one member of the research team and independently verified by a second member to ensure data accuracy before statistical analysis.

2.11 Statistical analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics version 24 (IBM Corp., Armonk, NY, USA). Categorical variables were presented as frequencies and percentages.

Associations between categorical variables were evaluated using Fisher's exact test because several contingency tables contained small expected cell counts. Statistical significance was set at $p < 0.05$.

2.12 Ethical considerations

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments. Ethical approval was obtained from the Institutional Review Board (IRB) of Beirut Arab University under approval number 2025-H-0180-M-R-0953 before the commencement of data collection.

Eligible participants were informed about the purpose, objectives, and procedures of the study prior to participation. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any time without penalty or consequences. No financial incentives were provided for participation.

To ensure participants' privacy and confidentiality, the questionnaire was completed anonymously, and no personally identifiable information was collected. Electronic data were stored in a password-protected database accessible only to the principal investigator and authorized members of the research team. All collected data were used exclusively for research purposes.

3. Results

3.1 Participant characteristics

A total of 100 participants receiving intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy were included in the study. The largest proportion of participants was aged 36–45 years (34.0%), 65.0% were women, and 70.0% were married. Most participants resided in Beirut (42.0%), followed by Mount Lebanon (19.0%) and the South Governorate (16.0%). The most frequently reported comorbidities were hypertension (16.0%), dyslipidemia (15.0%), and cardiovascular disease (13.0%), while 20.0% of

participants reported no comorbidities. Most participants reported no alcohol consumption (60.0%), whereas 42.0% smoked 1–20 cigarettes per day. Regarding occupation, 30.0% of participants were not working, while 18.0% were professionals. The sociodemographic and clinical characteristics of the study participants are presented in Table 1.

Table 1
Sociodemographic and clinical characteristics of study participants (N = 100)

Variable	Category	N (%)
Age (years)	20–35	21 (21.0)
	36–45	34 (34.0)
	46–55	23 (23.0)
	56–65	15 (15.0)
	≥ 65	7 (7.0)
Gender	Male	35 (35.0)
	Female	65 (65.0)
Marital status	Married	70 (70.0)
	Single	18 (18.0)
	Divorced	7 (7.0)
	Widowed	5 (5.0)
Governorate of residence	Beirut	42 (42.0)
	South Governorate	16 (16.0)
	North Governorate	15 (15.0)
	Mount Lebanon	19 (19.0)
	Bekaa	2 (2.0)
	Baalbek-Hermel	1 (1.0)
	Akkar	1 (1.0)
	Nabatiyeh	4 (4.0)
Comorbidities*	Fibromyalgia	3 (3.0)
	Rheumatoid arthritis	8 (8.0)
	Osteoarthritis	3 (3.0)
	Hypertension	16 (16.0)
	Diabetes mellitus	7 (7.0)
	Cardiovascular disease	13 (13.0)
	Dyslipidemia	15 (15.0)

** Multiple responses were permitted*

Variable	Category	N (%)
	Crohn's disease	3 (3.0)
	Other diseases	12 (12.0)
	None	20 (20.0)
Body fat percentage	2–5%	4 (4.0)
	6–13%	5 (5.0)
	14–17%	13 (13.0)
	18–24%	24 (24.0)
	25–31%	27 (27.0)
	≥ 32%	27 (27.0)
Alcohol consumption (per day)	Does not drink	60 (60.0)
	< 1 unit	21 (21.0)
	1–2 units	13 (13.0)
	3–4 units	6 (6.0)
Smoking status (per day)	Non-smoker	32 (32.0)
	1–20 cigarettes	42 (42.0)
	21–40 cigarettes	14 (14.0)
	41–60 cigarettes	6 (6.0)
	61–80 cigarettes	6 (6.0)
Sitting time at work	0–1 hour	28 (28.0)
	1–3 hours	28 (28.0)
	4–6 hours	22 (22.0)
	7–9 hours	15 (15.0)
	≥ 10 hours	7 (7.0)
Occupation	Legislators / senior officials / managers	9 (9.0)
	Professionals (highly skilled)	18 (18.0)
	Technicians & associate professionals	12 (12.0)
	Clerks	5 (5.0)
** Multiple responses were permitted*		

Variable	Category	N (%)
	Service & sales workers	11 (11.0)
	Skilled agricultural & craft workers	9 (9.0)
	Plant & machine operators	6 (6.0)
	Unemployed	30 (30.0)
** Multiple responses were permitted*		

3.2 Knowledge regarding IV NAD⁺ therapy

Regarding self-reported knowledge of IV NAD⁺ therapy, the largest proportion of participants reported moderate understanding (47.0%), followed by strong understanding (30.0%), whereas 22.0% and 1.0% reported weak and very weak understanding, respectively. Most participants agreed (53.0%) or strongly agreed (39.0%) that IV NAD⁺ therapy is beneficial for age-related conditions.

Regarding sources of information, 30.0% of participants reported learning about IV NAD⁺ therapy through sponsored social media advertisements, 29.0% through healthcare professionals, and 24.0% through recommendations from family or friends. In contrast, only 4.0% reported obtaining information from scientific research papers. The detailed knowledge-related findings are presented in Table 2.

Table 2
Self-reported knowledge, perceived benefits, and sources of information regarding IV NAD⁺ therapy among study participants (N = 100)

Domain	Variable	Response	N (%)
Self-reported knowledge	Self-rated understanding of IV NAD⁺ therapy	Strong	30 (30.0)
		Moderate	47 (47.0)
		Weak	22 (22.0)
		Very weak	1 (1.0)
Perceived benefits	IV NAD⁺ therapy is beneficial for age-related conditions	Strongly agree	39 (39.0)
		Agree	53 (53.0)
		Unsure	8 (8.0)
Sources of information	Scientific research papers	Yes	4 (4.0)
		No	96 (96.0)
	Healthcare professionals	Yes	29 (29.0)
		No	71 (71.0)
	Magazines or news articles	Yes	3 (3.0)
		No	97 (97.0)
	Family or friends	Yes	24 (24.0)
		No	76 (76.0)
	Sponsored social media advertisements	Yes	30 (30.0)
		No	70 (70.0)
	Estheticians, wellness clinics, or IV clinics	Yes	13 (13.0)

**Multiple responses were permitted for sources of information*

Domain	Variable	Response	N (%)
		No	87 (87.0)
	Podcasts or health influencers	Yes	12 (12.0)
		No	88 (88.0)

**Multiple responses were permitted for sources of information*

3.3 Attitudes toward IV NAD⁺ therapy

Nearly half of the participants (49.0%) perceived IV NAD⁺ therapy as moderately safe, while 37.0% considered it very safe. Only 1.0% perceived the therapy as unsafe, whereas 13.0% were unsure of its safety. The detailed findings regarding participants' attitudes and practices are presented in Table 3

3.4 Practices related to IV NAD⁺ therapy

Regarding participants' practices related to IV NAD⁺ therapy, 85.0% reported perceived improvement in their initial medical condition following treatment. Nearly half of the participants (46.0%) intended to continue IV NAD⁺ therapy long term, whereas 29.0% planned to continue for a limited time, 19.0% were unsure, and 6.0% did not intend to continue therapy. Most participants (84.0%) reported no adverse effects following IV NAD⁺ therapy. Among the 16 participants who reported adverse effects and had received more than one IV NAD⁺ therapy session, 50.0% reported that their side effects had alleviated over time, 25.0% reported that they had disappeared, 18.8% reported that they remained the same as during the first exposure, and one participant (6.3%) reported that the side effects had worsened. More than half of the participants (54.0%) reported concomitant medication use. Pain was the most common indication for receiving IV NAD⁺ therapy (80.0%). Among participants who received IV NAD⁺ therapy for pain, the back (26.3%) and shoulders (25.0%) were the most frequently reported pain regions. The detailed findings regarding participants' attitudes and practices are presented in Table 3.

Table 3
Attitudes and practices regarding IV NAD^+ therapy among study participants (N = 100)

Domain	Variable	Response	N (%)
Attitudes	Belief regarding the safety of IV NAD^+ therapy	Very safe	37 (37.0)
		Moderately safe	49 (49.0)
		Not safe	1 (1.0)
		Unsure	13 (13.0)
Practices	Perceived improvement in the initial medical condition following IV NAD^+ therapy	Yes	85 (85.0)
		No	15 (15.0)
	Future intention to continue IV NAD^+ therapy	Yes, long term	46 (46.0)
		Yes, for a limited time	29 (29.0)
		No	6 (6.0)
		Unsure	19 (19.0)
	Self-reported adverse effects following IV NAD^+ therapy	None	84 (84.0)
		Headache	5 (5.0)
		Nausea	3 (3.0)
		Other	8 (8.0)
	Changes in adverse effects over time*	Same as first exposure	3 (18.8)
		Became worse	1 (6.3)
		Alleviated	8 (50.0)
		Disappeared	4 (25.0)
	Concomitant medication use	Yes	54 (54.0)
		No	46 (46.0)

Domain	Variable	Response	N (%)
	Indications for IV NAD⁺ therapy**	Pain	80 (80.0)
		Fatigue	39 (39.0)
		Cognitive decline	34 (34.0)
		Anti-aging	32 (32.0)
		General well-being	8 (8.0)
	Pain regions before therapy***	Shoulders	20 (25.0)
		Back	21 (26.3)
		Lower limbs	7 (8.8)
		Hips	7 (8.8)
		Feet	10 (12.5)
		Neck	4 (5.0)
		Upper limbs	3 (3.8)
		Hands	5 (6.3)
		Fingers	6 (7.5)

** Among participants who reported adverse effects and had received more than one IV NAD⁺ therapy session (n = 16).*

*** Multiple responses were permitted for the question regarding indications for IV NAD⁺ therapy; therefore, percentages exceed 100%.*

**** Pain regions are reported only among participants who received IV NAD⁺ therapy for pain (n = 80); percentages are based on these participants.*

3.5 Perceived quality of life following IV NAD⁺ therapy

Participants generally reported favorable perceived health and well-being outcomes following IV NAD⁺ therapy. More than half of the participants (54.0%) reported feeling full of energy most or all of the time after treatment, while 65.0% reported an improvement in mood and 51.0% reported being less irritable. Regarding pain, 49.0% reported that pain did not interfere with work during the previous four weeks following therapy, whereas 46.0% reported that pain interfered only a little. In terms of overall health,

40.0% of participants perceived their health as much better than before IV NAD^+ therapy and 35.0% reported it to be somewhat better than before. Furthermore, following IV NAD^+ therapy, 46.0% of participants reported that their health did not limit their daily activities. The detailed perceived quality-of-life findings are presented in Table 4.

Table 4
Perceived quality of life following IV NAD^+ therapy among study participants (N = 100)

Domain	Variable	Response	N (%)
Energy levels	Felt full of energy after IV NAD^+ therapy	All of the time	12 (12.0)
		Most of the time	42 (42.0)
		A good bit of the time	19 (19.0)
		Some of the time	12 (12.0)
		A little bit of the time	9 (9.0)
		None of the time	6 (6.0)
Mood and irritability	Change in irritability after IV NAD^+ therapy	Less irritable	51 (51.0)
		No change	33 (33.0)
		More irritable	16 (16.0)
	Mood improvement after IV NAD^+ therapy	Yes	65 (65.0)
		No	35 (35.0)
Pain before therapy	Bodily pain severity before IV NAD^+	None	27 (27.0)
		Very mild	23 (23.0)
		Mild	16 (16.0)
		Moderate	22 (22.0)
		Severe	10 (10.0)
		Very severe	2 (2.0)
Pain interference after therapy	Pain interfering with work (last 4 weeks)	Not at all	49 (49.0)

Domain	Variable	Response	N (%)
		A little bit	46 (46.0)
		Quite a bit	5 (5.0)
Emotional impact before therapy	Emotional problems affecting work/activities	Yes	35 (35.0)
		No	65 (65.0)
Functional limitation before therapy	Health limited ability to perform activities	Limited a lot	7 (7.0)
		Limited a little	30 (30.0)
		Not limited at all	63 (63.0)
Work/activity reduction before therapy	Cut down time spent on work/activities	Yes	32 (32.0)
		No	68 (68.0)
Difficulty performing activities before therapy		Yes	38 (38.0)
		No	62 (62.0)
Self-rated health before IV NAD^+ therapy		Excellent	13 (13.0)
		Very good	32 (32.0)
		Good	30 (30.0)
		Fair	23 (23.0)
		Poor	2 (2.0)
Perceived health change after IV NAD^+ therapy		Much better than before	40 (40.0)
		Somewhat better than before	35 (35.0)
		About the same	24 (24.0)
		Somewhat worse than before	1 (1.0)

Domain	Variable	Response	N (%)
Functional limitation after IV NAD⁺ therapy	Health now limits activities	Limited a lot	18 (18.0)
		Limited a little	36 (36.0)
		Not limited at all	46 (46.0)

3.6 Factors associated with selected treatment-related perceptions and intention to continue IV NAD⁺ therapy

Several participant characteristics were significantly associated with treatment-related perceptions and intention to continue IV NAD⁺ therapy (Table 5). Intention to continue IV NAD⁺ therapy was significantly associated with alcohol consumption ($p = 0.004$), perceived safety of IV NAD⁺ therapy ($p = 0.020$), self-reported knowledge of IV NAD⁺ therapy ($p = 0.019$), and perceived benefits of IV NAD⁺ therapy for age-related conditions ($p < 0.001$). In addition, perceived benefits of IV NAD⁺ therapy for age-related conditions were significantly associated with marital status ($p = 0.019$) and self-reported knowledge of IV NAD⁺ therapy ($p < 0.001$). Finally, perceived safety of IV NAD⁺ therapy was significantly associated with exposure to sponsored social media advertisements ($p = 0.035$). The detailed results of the bivariate analyses are presented in Table 5.

Table 5
Bivariate associations between participant characteristics and selected perceptions and outcomes related to IV NAD⁺ therapy (N = 100) A. Outcome: Intention to continue IV NAD⁺ therapy

Characteristic	Category	Yes, long term, n (%)	Yes, limited time, n (%)	No, n (%)	Unsure, n (%)	Fisher's exact p-value
Alcohol consumption per day	Does not drink	32 (69.6)	15 (51.7)	4 (66.7)	9 (47.4)	0.004
	< 1 unit	8 (17.4)	3 (10.3)	1 (16.7)	9 (47.4)	
	1–2 units	6 (13.0)	7 (24.1)	0 (0.0)	0 (0.0)	
	3–4 units	0 (0.0)	4 (13.8)	1 (16.7)	1 (5.3)	
Perceived safety of IV NAD⁺ therapy	Very safe	22 (47.8)	12 (41.4)	0 (0.0)	3 (15.8)	0.020
	Moderately safe	20 (43.5)	13 (44.8)	3 (50.0)	13 (68.4)	
	Not safe	0 (0.0)	0 (0.0)	1 (16.7)	0 (0.0)	
	Unsure	4 (8.7)	4 (13.8)	2 (33.3)	3 (15.8)	
Self-reported knowledge of IV NAD⁺ therapy	Strong	16 (34.8)	8 (27.6)	5 (83.3)	1 (5.3)	0.019
	Moderate	19 (41.3)	14 (48.3)	1 (16.7)	13 (68.4)	
	Weak	11 (23.9)	7 (24.1)	0 (0.0)	4 (21.1)	
	Very weak	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.3)	
Perceived benefit for age-related conditions	Strongly agree	27 (58.7)	10 (34.5)	0 (0.0)	2 (10.5)	< 0.001
	Agree	18 (39.1)	16 (55.2)	4 (66.7)	15 (78.9)	
	Unsure	1 (2.2)	3 (10.3)	2 (33.3)	2 (10.5)	

1. **B. Outcome: Perceived benefit of IV NAD⁺ therapy for age-related conditions**

Characteristic	Category	Strongly agree, n (%)	Agree, n (%)	Unsure, n (%)	Fisher's exact p-value
Marital status	Married	31 (79.5)	37 (69.8)	2 (25.0)	0.019
	Single	7 (17.9)	8 (15.1)	3 (37.5)	
	Divorced	1 (2.6)	4 (7.5)	2 (25.0)	
	Widowed	0 (0.0)	4 (7.5)	1 (12.5)	
Self-reported knowledge of IV NAD⁺ therapy	Strong	21 (53.8)	8 (15.1)	1 (12.5)	< 0.001
	Moderate	10 (25.6)	35 (66.0)	2 (25.0)	
	Weak	7 (17.9)	10 (18.9)	5 (62.5)	
	Very weak	1 (2.6)	0 (0.0)	0 (0.0)	

1. **C. Outcome: Perceived safety of IV NAD⁺ therapy**

Characteristic	Category	Very safe, n (%)	Moderately safe, n (%)	Not safe, n (%)	Unsure, n (%)	Fisher's exact p-value
Exposure to sponsored social media advertisements	No	31 (83.8)	28 (57.1)	1 (100.0)	10 (76.9)	0.035
	Yes	6 (16.2)	21 (42.9)	0 (0.0)	3 (23.1)	

Values are presented as n (%). Percentages were calculated within each outcome-response category. P-values were calculated using Fisher's exact test. Only statistically significant associations are presented.

4. Discussion

This study provides one of the first assessments of the knowledge, attitudes, practices, perceived quality of life, and treatment-related perceptions of adults residing in Lebanon receiving IV NAD⁺ therapy.

Overall, participants in the present study generally reported moderate self-perceived knowledge of IV NAD⁺ therapy, while most believed that the therapy may be beneficial for age-related conditions. These findings likely reflect the increasing public interest in IV NAD⁺ therapy as a wellness and healthy aging intervention despite the current lack of robust clinical evidence supporting many of its proposed therapeutic indications. NAD⁺ plays a central role in cellular energy metabolism, mitochondrial function, DNA repair, and cellular signaling, and declining intracellular NAD⁺ levels have been associated with aging and several chronic diseases, contributing to growing interest in therapeutic strategies aimed at

restoring NAD^+ availability (3, 6). However, self-reported knowledge reflects participants' perceived level of understanding and may not necessarily correspond to objective knowledge regarding the mechanisms, efficacy, or evidence supporting IV NAD^+ therapy. This distinction is particularly important because current evidence supporting the clinical effectiveness of IV NAD^+ therapy remains limited, and systematic reviews emphasize the need for additional well-designed clinical trials before definitive conclusions regarding its efficacy and safety can be established (6, 9)

An important finding was that sponsored social media advertisements and healthcare professionals were the most frequently reported sources of information regarding IV NAD^+ therapy, whereas only a small proportion of participants reported obtaining information from scientific research papers. This pattern highlights the growing influence of digital media on health information-seeking behaviors and suggests that many individuals rely on readily accessible online content rather than peer-reviewed scientific evidence when learning about emerging health interventions. Similar trends have been observed for complementary and alternative medicine, where social media has become a major platform for disseminating health-related information, although the quality and accuracy of such information remain variable. Consequently, individuals may be exposed to promotional or incomplete information that does not fully reflect the current state of scientific evidence. Healthcare professionals therefore play a critical role in providing balanced, evidence-based information to support informed decision-making regarding IV NAD^+ therapy (11).

Participants generally expressed favorable attitudes toward IV NAD^+ therapy, with most perceiving the treatment as safe and reporting improvement in their initial medical condition following therapy. Nearly half also indicated an intention to continue IV NAD^+ therapy long term, while relatively few participants reported adverse effects. These findings are consistent with the increasing interest in IV NAD^+ therapy as a complementary wellness intervention and may reflect users' positive personal experiences with treatment. However, perceived improvement should be interpreted with caution, as self-reported outcomes may be influenced by placebo effects, participant expectations, or other concurrent interventions, and do not necessarily demonstrate clinical efficacy. Although IV NAD^+ therapy has been proposed as a potential intervention for conditions such as fatigue, chronic pain, neurodegenerative disorders, and healthy aging, the current evidence remains limited and heterogeneous, with systematic reviews emphasizing the need for larger, well-designed randomized controlled trials to establish its efficacy and long-term safety (6, 9).

Participants also reported generally favorable perceived quality-of-life outcomes following IV NAD^+ therapy. More than half of the participants reported feeling energetic most or all of the time after treatment, while improvements in mood and reduced irritability were commonly reported. In addition, most participants perceived their overall health to be better than before receiving IV NAD^+ therapy, and 46.0% reported that their health did not limit their daily activities following IV NAD^+ therapy. These findings are consistent with the proposed biological role of NAD^+ in maintaining mitochondrial function, cellular energy production, and metabolic homeostasis, mechanisms that have been hypothesized to contribute to improved physical and psychological well-being (3–6). Nevertheless, the observed

improvements should be interpreted cautiously because they were based on participants' subjective perceptions and assessed using a cross-sectional design without baseline measurements or a comparison group. Consequently, the findings cannot establish a causal relationship between IV NAD^+ therapy and the reported quality-of-life improvements. Existing clinical evidence regarding the effects of NAD^+ supplementation on patient-reported outcomes remains limited and heterogeneous, highlighting the need for adequately powered randomized controlled trials to determine whether these perceived benefits translate into measurable clinical improvements (6, 9).

The present study also identified several factors associated with participants' perceptions and behavioral intentions regarding IV NAD^+ therapy. Greater self-reported knowledge was associated with both stronger perceived benefits of IV NAD^+ therapy and a greater intention to continue treatment. Because the present study was cross-sectional, the direction of these associations cannot be determined. It is possible that participants with greater perceived knowledge were more likely to view the therapy favorably, or conversely, that positive experiences with IV NAD^+ therapy contributed to greater self-perceived knowledge. Perceived safety and perceived benefits of IV NAD^+ therapy were also significantly associated with intention to continue treatment, suggesting that treatment-related perceptions may be related to future treatment decisions. In addition, exposure to sponsored social media advertisements was significantly associated with perceived safety of IV NAD^+ therapy, highlighting the potential influence of digital media on individuals' perceptions of emerging health interventions. Given the promotional nature of much online health-related content, these findings reinforce the importance of ensuring that information disseminated through digital platforms is evidence-based and balanced (11). Finally, alcohol consumption and marital status were also significantly associated with selected perceptions and outcomes related to IV NAD^+ therapy. Although the underlying reasons for these associations remain unclear, they may reflect differences in health behaviors, lifestyle characteristics, or access to health information among participant subgroups. These findings should be interpreted cautiously and warrant further investigation in larger prospective studies.

Strengths and limitations

This study has several strengths. To our knowledge, it is among the first to investigate the knowledge, attitudes, practices, perceived quality of life, and factors associated with IV NAD^+ therapy among adults receiving treatment in Lebanon. The study provides novel real-world data on an emerging complementary therapy for which published evidence remains limited. Furthermore, the comprehensive assessment of participants' perceptions and treatment-related experiences offers valuable preliminary insights that may inform future clinical research and patient education initiatives. However, several limitations should be acknowledged. The cross-sectional design precludes the establishment of causal relationships between IV NAD^+ therapy and the reported outcomes. Data were self-reported and may therefore be subject to recall and social desirability biases. In addition, participants were recruited using convenience sampling from physician-owned wellness clinics, which may limit the generalizability of the findings to other populations. Finally, quality-of-life outcomes reflected participants' perceptions rather

than objective clinical measurements, and no control group or baseline assessment was available for comparison

5. Conclusion

This study provides novel insights into the knowledge, attitudes, practices, perceived quality of life, and factors associated with selected treatment-related perceptions and behavioral intentions among adults residing in Lebanon receiving intravenous nicotinamide adenine dinucleotide (IV NAD^+) therapy. Participants generally reported moderate self-perceived knowledge, favorable attitudes toward IV NAD^+ therapy, and perceived improvements in their initial medical condition and health-related outcomes following treatment. Self-reported knowledge, perceived safety, perceived benefits, alcohol consumption, marital status, and exposure to sponsored social media advertisements were significantly associated with selected treatment-related perceptions and intention to continue IV NAD^+ therapy. Despite these findings, the results should be interpreted cautiously because of the cross-sectional design and reliance on self-reported data. Further well-designed prospective studies and randomized controlled trials are warranted to establish the efficacy, safety, and long-term clinical effects of IV NAD^+ therapy across different populations.

Abbreviations

IRB
Institutional Review Board
IV
Intravenous
KAP
Knowledge, Attitudes, and Practices
NAD^+
Nicotinamide Adenine Dinucleotide
QoL
Quality of Life
SF-36
36-Item Short Form Health Survey
SPSS
Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments. Ethical approval was obtained from the Institutional Review Board (IRB) of

Beirut Arab University under approval number **2025-H-0180-M-R-0953** prior to the commencement of data collection. Written informed consent was obtained from all participants before participation in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Clinical trial number

Not applicable

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Author Contribution

DEJ contributed to study development, data collection, data coding and analysis, preparation of tables, manuscript drafting, and revision. SH, JK, HH, MI, MEA, AF, AH, and RM contributed to study development, data collection, manuscript drafting, and revision. NAY contributed to data collection. MG contributed to research supervision and statistical analysis. MAA contributed to conceptualization, methodology, and manuscript revision. MC supervised the research process, statistical analysis, manuscript writing, editing, and revision. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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