Decoding Nutritional-Supplement Benefits:

Managing Neuropathic Pain and Neurodegeneration

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INTRODUCTION

Neuropathic pain and neurodegenerative disorders represent significant challenges to global health, affecting millions of individuals and imposing substantial personal and societal burdens. Neuropathic pain, characterized by chronic symptoms such as burning sensations, tingling, and shooting pain, arises from damage or dysfunction of the nervous system and severely impairs quality of life (1). Neurodegenerative disorders, including Alzheimer's disease, Parkinson's disease, and amyotrophic lateral sclerosis (ALS), are progressive conditions that lead to neuronal dysfunction and loss, ultimately causing cognitive, motor, and functional impairments (2). Together, these conditions account for a significant proportion of healthcare expenditures and disability-adjusted life years globally (3).

Conventional treatments for neuropathic pain, such as anticonvulsants, antidepressants, and opioids, often provide inadequate relief and are associated with numerous side effects, including sedation and dependence (4). Similarly, pharmacological therapies for neurodegenerative diseases, such as acetylcholinesterase inhibitors and dopamine agonists, primarily focus on symptom management without altering the underlying disease progression (5). These limitations have prompted growing interest in nutritional supplements as adjunctive therapies for both neuropathic pain and neurodegenerative conditions.

Nutritional supplements, including omega-3 fatty acids, curcumin, vitamin D, B vitamins, and coenzyme Q10, have demonstrated potential neuroprotective, anti-inflammatory, and antioxidant properties in preclinical and clinical studies (6, 7). These supplements are thought to alleviate neuropathic pain by modulating inflammatory pathways, reducing oxidative stress, and promoting nerve regeneration. Similarly, in neurodegenerative disorders, they may support mitochondrial function, reduce protein aggregation, and enhance synaptic

plasticity, potentially slowing disease progression and improving cognitive and motor function (8, 9).

Despite promising evidence, the integration of nutritional supplements into routine clinical practice remains limited. Challenges include variability in clinical outcomes, a lack of standardized dosing guidelines, and insufficient awareness among healthcare providers about the potential benefits and mechanisms of action of these supplements. Furthermore, patient adherence and the perception of supplements as “complementary” rather than “essential” treatments may hinder their widespread adoption (10).

RATIONALE OF THE STUDY

Neuropathic pain and neurodegenerative disorders contribute significantly to global morbidity and disability, highlighting the urgent need for effective therapeutic strategies. While conventional pharmacological treatments provide symptomatic relief, their limited efficacy, side effects, and inability to address underlying disease mechanisms underscore the need for alternative or adjunctive therapies. Nutritional supplements offer a promising avenue due to their multifaceted mechanisms of action, including antioxidant, anti-inflammatory, and neuroprotective effects.

Despite their potential, the clinical adoption of nutritional supplements remains inconsistent. Real-world data on their effectiveness, safety, and integration into treatment regimens are lacking. This study aims to fill this gap by exploring how clinicians perceive and utilize nutritional supplements in managing neuropathic pain and neurodegeneration, with the goal of improving patient outcomes and promoting evidence-based practices.

STUDY OBJECTIVE

The primary objective of this study is to evaluate the real-world usage, effectiveness, and tolerability of nutritional supplements for managing neuropathic pain and neurodegenerative disorders. Specifically, the study aims to:

1. **Assess Clinician Knowledge and Understanding:** Investigate clinicians' awareness of the therapeutic potential and mechanisms of action of nutritional supplements.
2. **Examine Prescribing Trends:** Analyze how often and under what circumstances clinicians recommend nutritional supplements compared to traditional therapies.
3. **Evaluate Clinical Outcomes and Safety:** Gather insights into clinicians' perspectives on the effectiveness and safety of nutritional supplements for managing neuropathic pain and neurodegenerative disorders.
4. **Analyze Patient Characteristics:** Identify the demographics and clinical profiles of patients most prescribed nutritional supplements, assessing their suitability for such interventions.
5. **Explore Challenges and Opportunities:** Identify obstacles hindering the adoption of nutritional supplements in clinical settings and uncover potential strategies for their broader acceptance and integration.

METHODS

The study employed a survey-based method, with a structured questionnaire distributed among healthcare professionals who treat neuropathic pain and neurodegenerative disorders. The questionnaire aimed to collect data on:

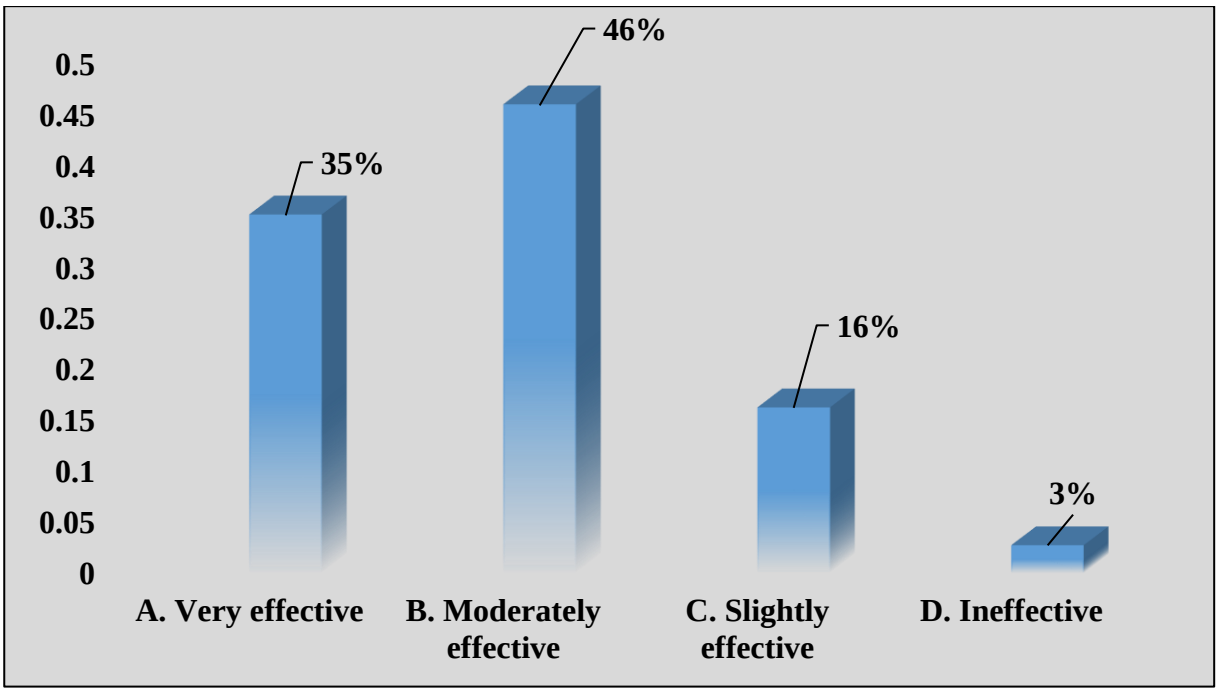
1. **Survey Design**: A structured questionnaire was developed to cover key areas such as clinician familiarity with nutritional supplements, prescribing patterns, perceived effectiveness, safety concerns, and patient demographics. The survey was reviewed and validated by experts in neurology and pain management to ensure relevance and accuracy.
2. **Participant Recruitment**: The survey targeted neurologists, pain specialists, and general practitioners with experience in managing neuropathic pain and neurodegenerative conditions. Participants were recruited across various regions to ensure a diverse and representative sample.
3. **Data Collection**: Responses were collected physically over a three-month period. The data were anonymized to ensure confidentiality and to encourage honest and unbiased feedback from participants.
4. **Data Analysis**: Quantitative methods were used to analyze the collected data, identifying trends and patterns in prescribing practices, effectiveness ratings, and safety concerns. Descriptive statistics summarized the data, while comparative analyses assessed variations based on clinician specialty, patient demographics, and treatment settings.
5. **Ethical Considerations**: The study was conducted in accordance with ethical guidelines for research involving Informed consent was obtained from all participants clinicians for the study.

RESULTS

A total of 114 HCPs participated in the survey. Below is the summary of the responses.

1. As per your clinical experience, how effective is Methylcobalamin in managing diabetic neuropathy?

A. Very effective
B. Moderately effective
C. Slightly effective
D. Ineffective



- **Very effective:** 35% of clinicians believe nutritional supplements are very effective.
- **Moderately effective:** 46% of clinicians find them moderately effective.
- **Slightly effective:** 16% perceive them as slightly effective.
- **Ineffective:** 3% consider them ineffective.

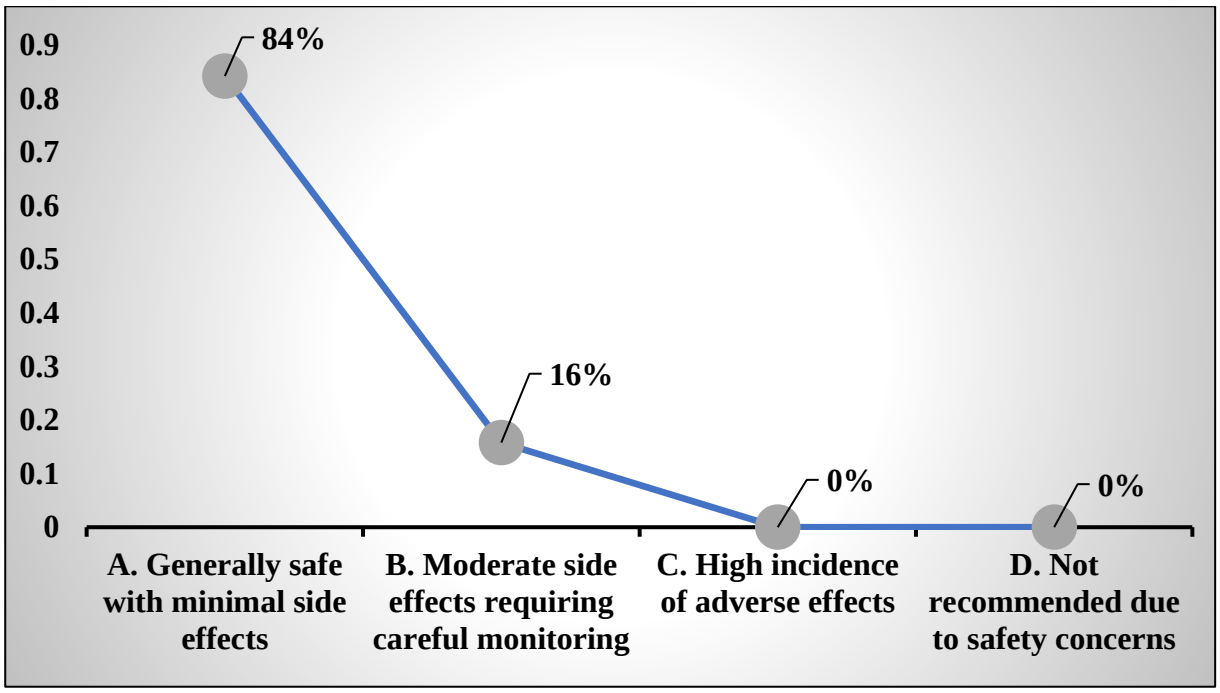
2. According to you,which statements (among the following) best describes the safety profile of Methylcobalamin in diabetic patients?

A. Generally safe with minimal side effects

B. Moderate side effects requiring careful monitoring

C. High incidence of adverse effects

D. Not recommended due to safety concerns



- **Generally Safe with Minimal Side Effects (84%):** The majority consider nutritional supplements to be generally safe.
- **Moderate Side Effects Requiring Careful Monitoring (16%):** A smaller proportion believe they require monitoring for moderate side effects.

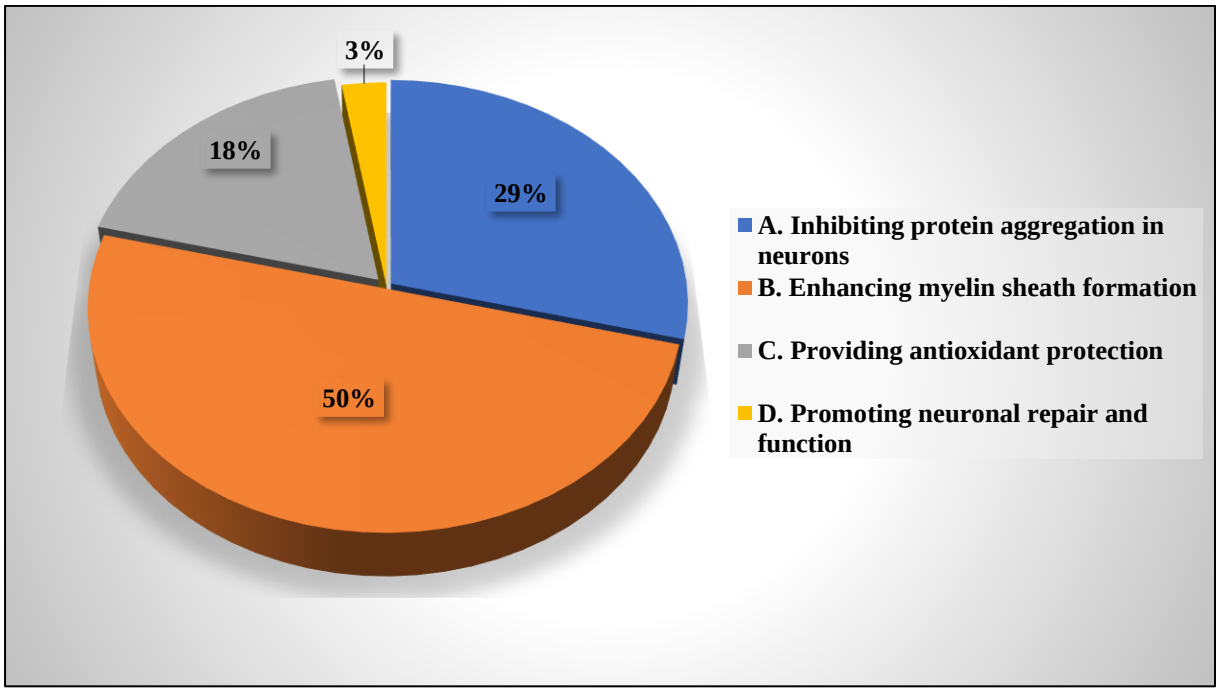
3. According to you, Methylcobalamin is thought to be beneficial in neurodegenerative diseases primarily due to –

A. Inhibiting protein aggregation in neurons

B. Enhancing myelin sheath formation

C. Providing antioxidant protection

D. Promoting neuronal repair and function



- **Inhibiting protein aggregation in neurons (29%):** Some clinicians believe Methylcobalamin's benefits stem from its role in reducing protein aggregation in neurons.
- **Enhancing myelin sheath formation (50%):** The majority attribute its effectiveness to its role in supporting myelin sheath formation.
- **Providing antioxidant protection (18%):** A smaller percentage view antioxidant protection as its primary benefit.
- **Promoting neuronal repair and function (3%):** Few consider neuronal repair and function as the main mechanism.

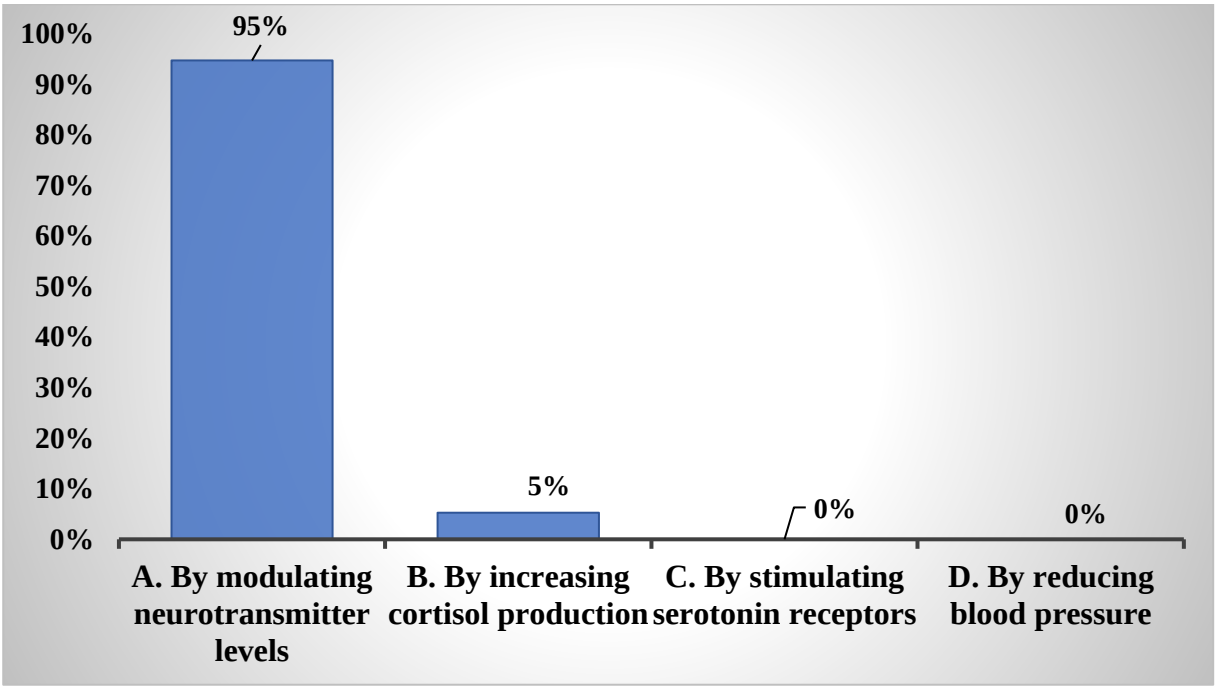
4. **According to you, how does Methylcobalamin contribute to reducing anxiety and depression symptoms?**

A. By modulating neurotransmitter levels

B. By increasing cortisol production

C. By stimulating serotonin receptors

D. By reducing blood pressure



- **By modulating neurotransmitter levels (95%):** The majority of doctors believe Methylcobalamin helps with anxiety and depression by balancing brain chemicals.
- **By increasing cortisol production (5%):** A few think it works by raising stress hormone levels.

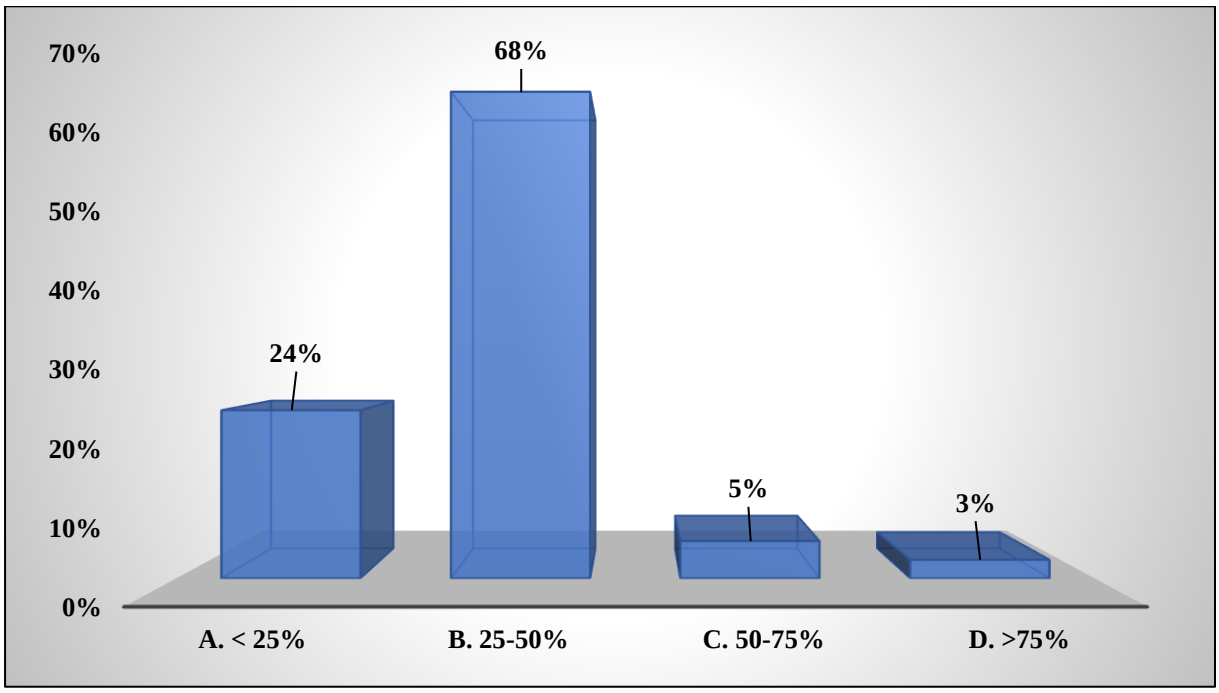
5. What percentage of your patients with anxiety and depression respond positively to Methylcobalamin treatment?

A. < 25%

B. 25-50%

C. 50-75%

D. >75%



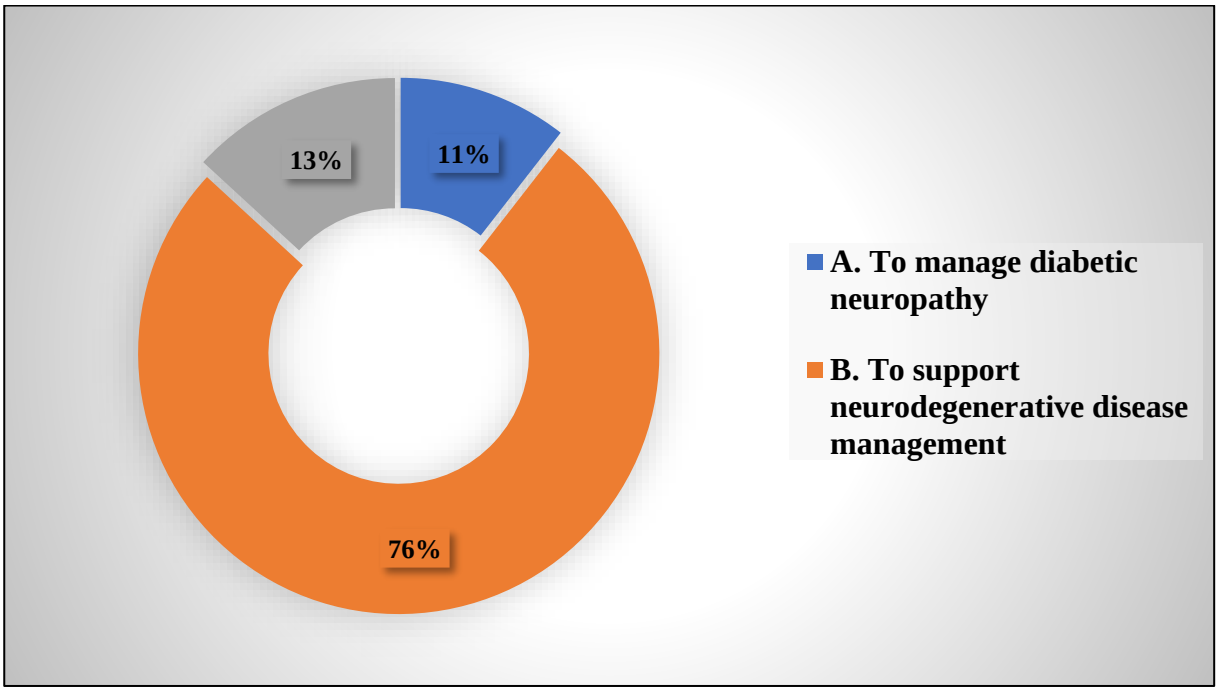
- **< 25% (24%):** Nearly a quarter of patients show a positive response to Methylcobalamin treatment.
- **25-50% (68%):** The majority of patients respond positively within this range.
- **50-75% (5%) & > 75% (3%):** A small percentage of patients experience significant improvement.

6. **In your clinical practice, what is your primary reason for prescribing Benfotiamine?**

A. To manage diabetic neuropathy

B. To support neurodegenerative disease management

C. Other (please specify)



- **To manage diabetic neuropathy (11%) & Other (13%):** A smaller percentage prescribe Benfotiamine specifically for diabetic neuropathy.
- **To support neurodegenerative disease management (76%):** The majority prescribe Benfotiamine for its potential benefits in managing neurodegenerative conditions.

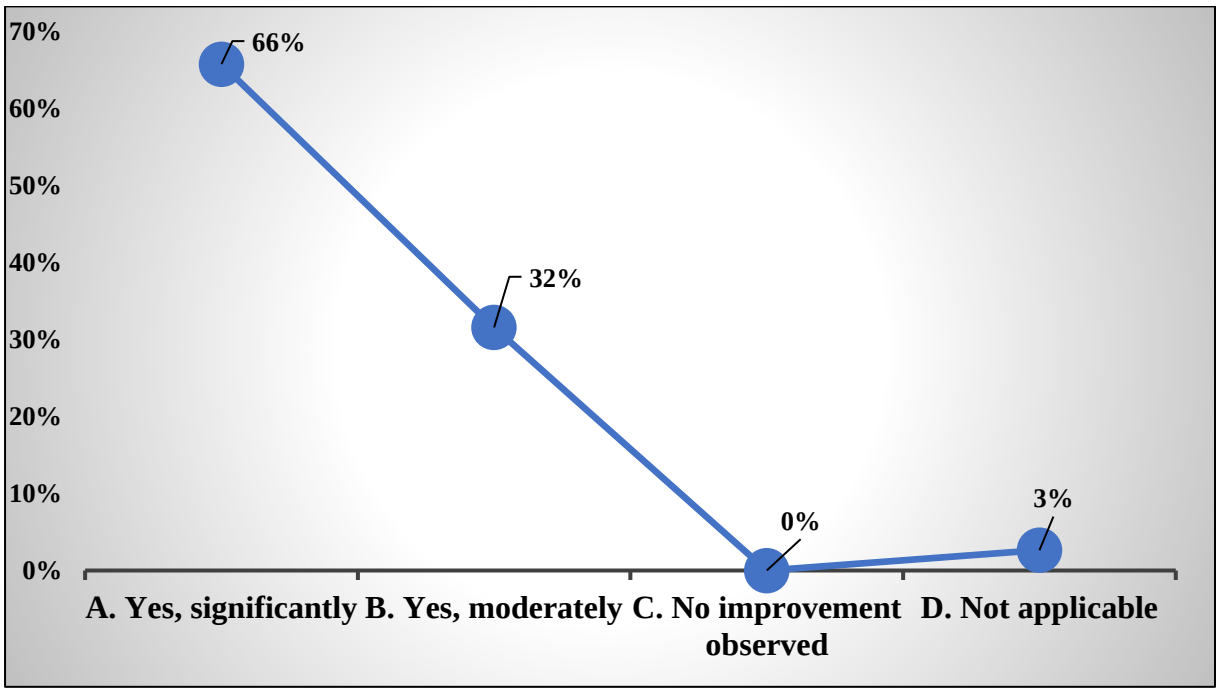
7. **Have you observed improvements in nerve function tests (E.g., nerve conduction studies) with Benfotiamine treatment?**

A. Yes, significantly

B. Yes, moderately

C. No improvement observed

D. Not applicable



- The majority (66%) observed significant improvements in nerve function tests with Benfotiamine, while 32% saw moderate improvements, and 3% found it not applicable.

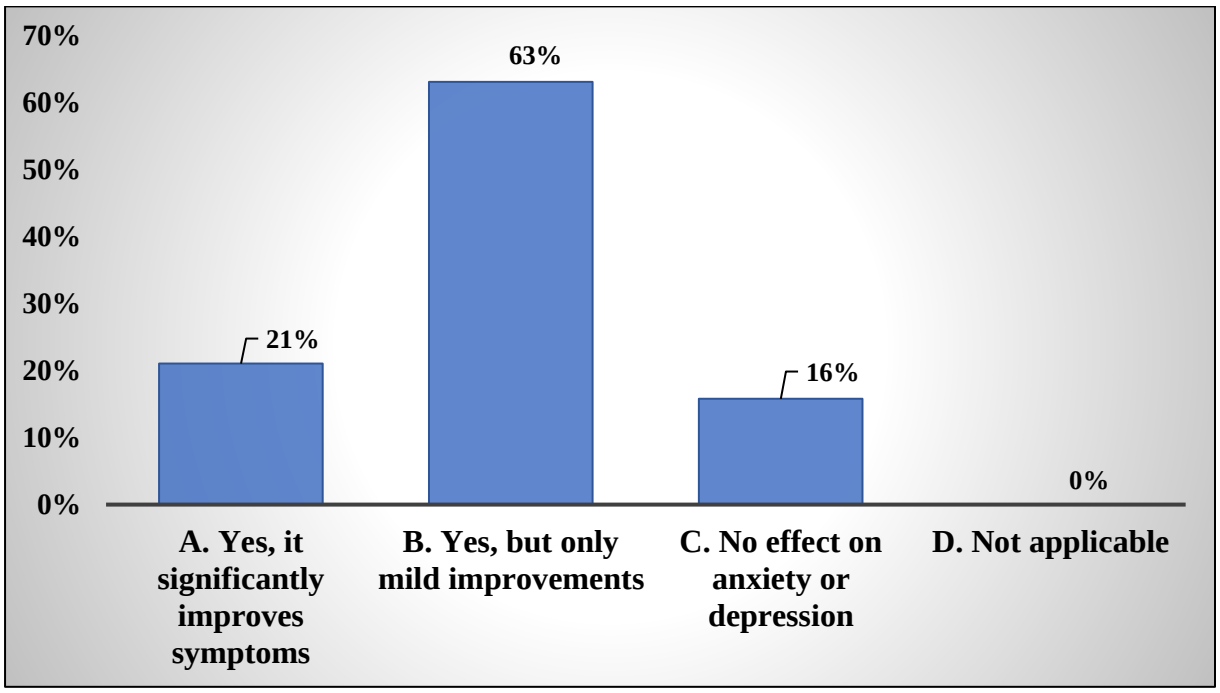
8. Have you observed any impact of Benfotiamine on anxiety or depression in your patients?

A. Yes, it significantly improves symptoms

B. Yes, but only mild improvements

C. No effect on anxiety or depression

D. Not applicable



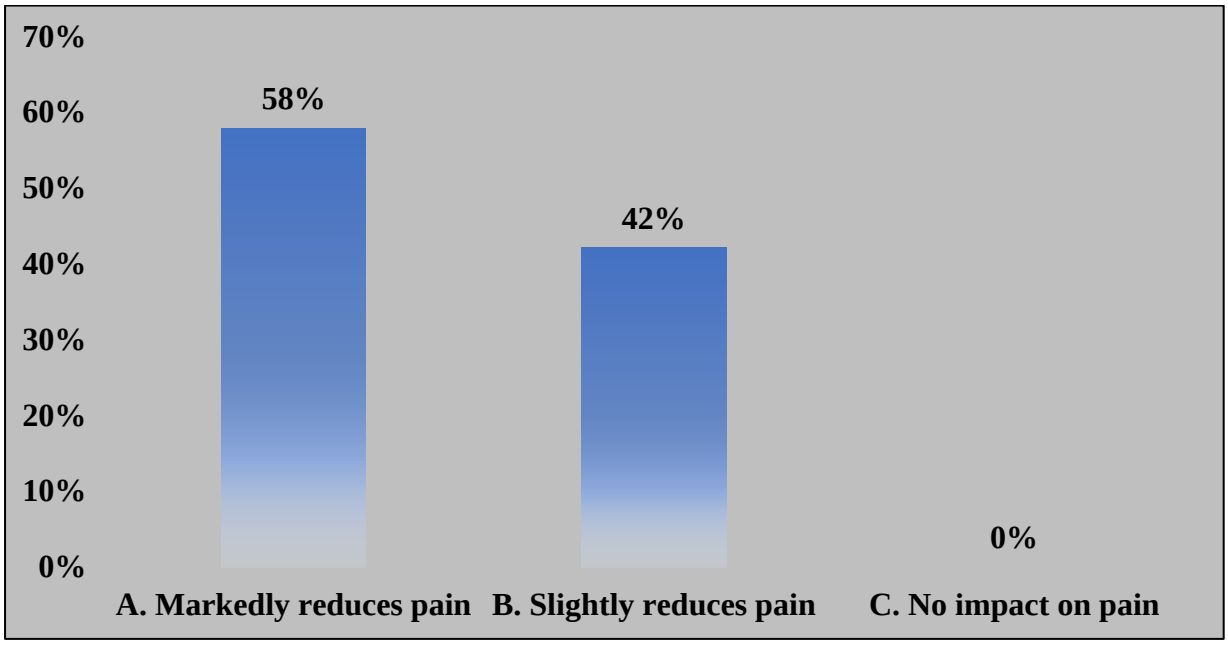
- **Yes, it significantly improves symptoms (21%):** A minority observed significant improvements in anxiety or depression with Benfotiamine.
- **Yes, but only mild improvements (63%):** The majority report mild improvements in anxiety or depression symptoms.
- **No effect on anxiety or depression (16%):** Some practitioners found no impact on anxiety or depression.

9. **In your clinical experience, how does Benfotiamine impact neuropathic pain in diabetic patients?**

A. Markedly reduces pain

B. Slightly reduces pain

C. No impact on pain



- **Markedly reduces pain (58%):** The majority report a significant reduction in neuropathic pain in diabetic patients with Benfotiamine.
- **Slightly reduces pain (42%):** A smaller percentage observe only mild reductions in neuropathic pain.
- **No impact on pain (0%):** None of the respondents found Benfotiamine to have no effect on neuropathic pain in diabetic patients.

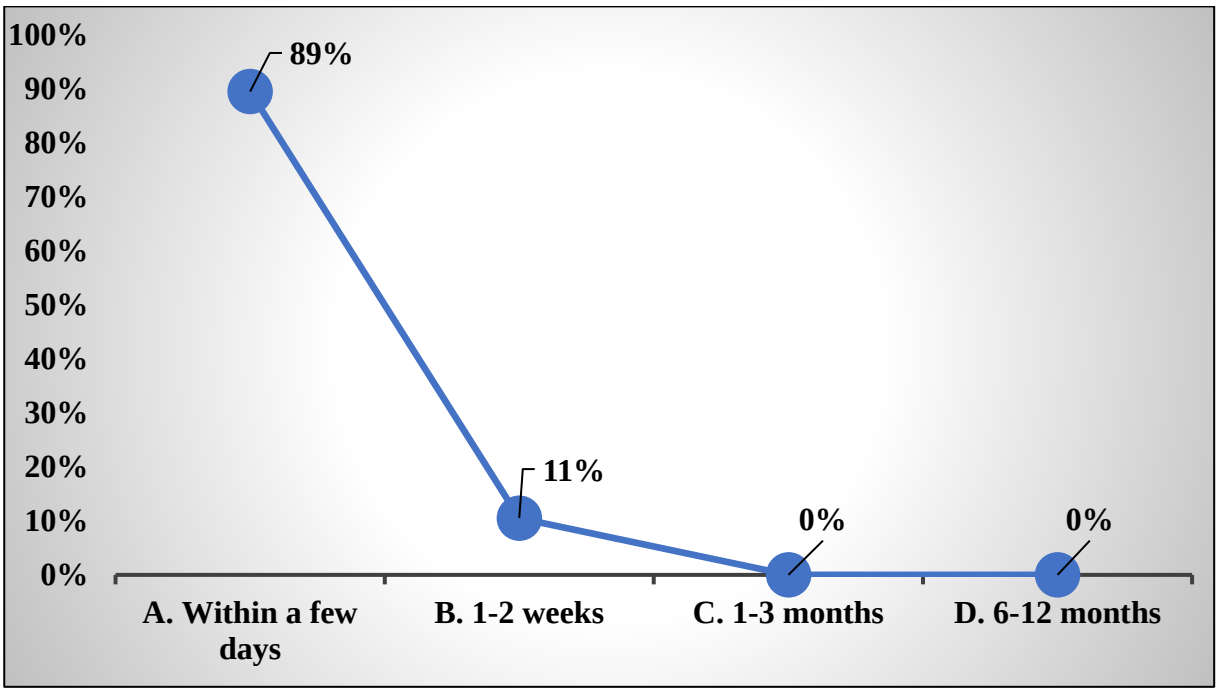
10.How long typically does it take for patients to experience improvement in neuropathic symptoms with Benfotiamine therapy?

A. Within a few days

B. 1-2 weeks

C. 1-3 months

D. 6-12 months



- **Within a few days (89%):** The majority of patients experience improvement in neuropathic symptoms within a few days of starting Benfotiamine therapy.
- **1-2 weeks (11%):** A smaller percentage observe improvements within 1-2 weeks.
- **1-3 months (0%) and D. 6-12 months (0%):** No respondents report improvement taking longer than 2 weeks.

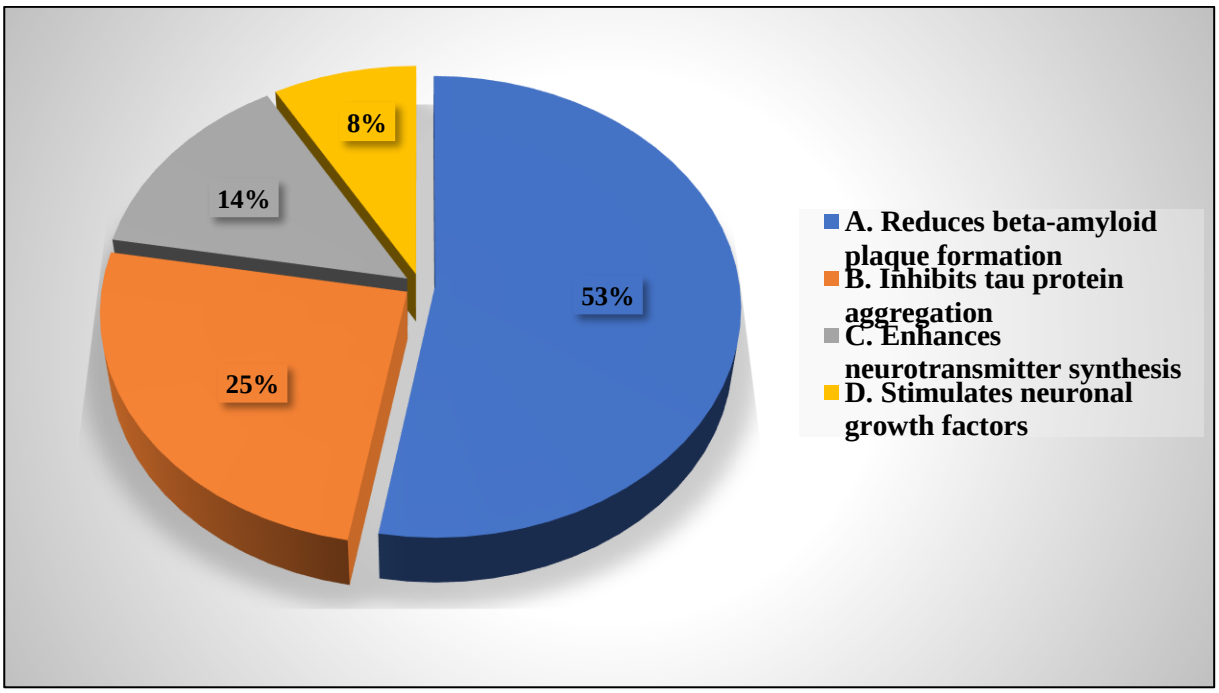
11. According to you, how does Chromium Polynicotinate affect the neurodegenerative diseases?

A. Reduces beta-amyloid plaque formation

B. Inhibits tau protein aggregation

C. Enhances neurotransmitter synthesis

D. Stimulates neuronal growth factors



- **Reduces beta-amyloid plaque formation (53%):** The majority believe Chromium Polynicotinate primarily reduces beta-amyloid plaque formation in neurodegenerative diseases.
- **Inhibits tau protein aggregation (25%):** A significant portion attribute its effects to inhibiting tau protein aggregation.
- **Enhances neurotransmitter synthesis (14%):** Some suggest it enhances neurotransmitter synthesis.
- **Stimulates neuronal growth factors (8%):** A smaller percentage believe it stimulates neuronal growth factors.

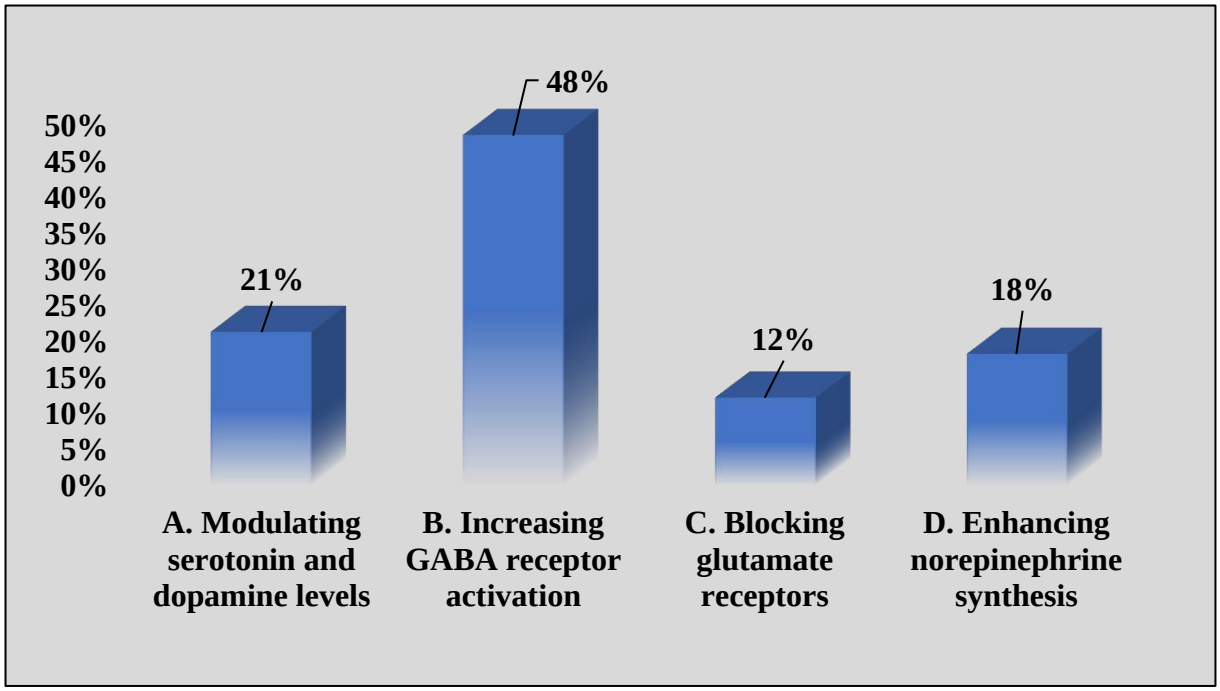
12. According to you, how does Chromium Polynicotinate exert its anti-depressant effect?

A. Modulating serotonin and dopamine levels

B. Increasing GABA receptor activation

C. Blocking glutamate receptors

D. Enhancing norepinephrine synthesis



- **Modulating serotonin and dopamine levels (21%):** Some attribute Chromium Polynicotinate's anti-depressant effect to its modulation of serotonin and dopamine levels.
- **Increasing GABA receptor activation (48%):** The majority believe it works by increasing GABA receptor activation.
- **Blocking glutamate receptors (12%):** A smaller percentage suggest it blocks glutamate receptors.
- **Enhancing norepinephrine synthesis (18%):** Some attribute its effects to enhanced norepinephrine synthesis.

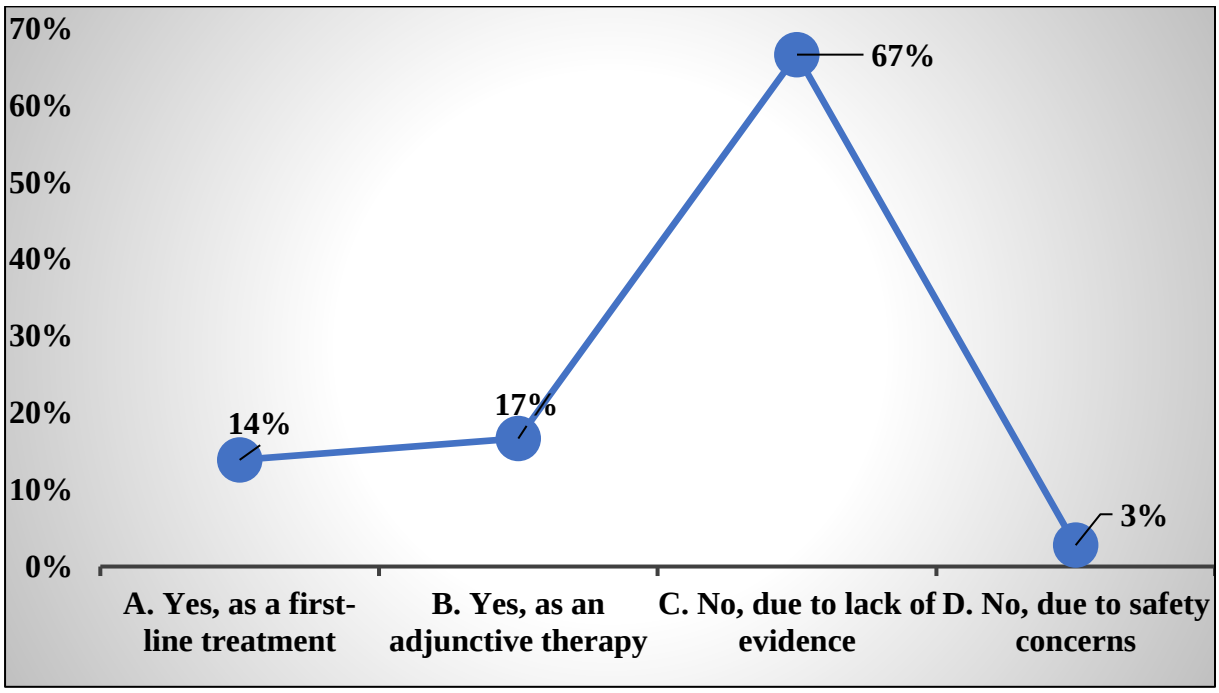
13.Do you prescribe Myo-inositol to patients with neurodegenerative diseases (E.g., Parkinson's disease, Alzheimer's disease)?

A. Yes, as a first-line treatment

B. Yes, as an adjunctive therapy

C. No, due to lack of evidence

D. No, due to safety concerns



- **Yes, as a first-line treatment (14%):** A minority prescribe Myo-inositol as a first-line treatment for neurodegenerative diseases.
- **Yes, as an adjunctive therapy (17%):** Some use it as a complementary treatment alongside other therapy.
- **No, due to lack of evidence (67%):** The majority refrain from prescribing it due to insufficient supporting evidence.
- **No, due to safety concerns (3%):** A small percentage avoid it due to safety concerns.

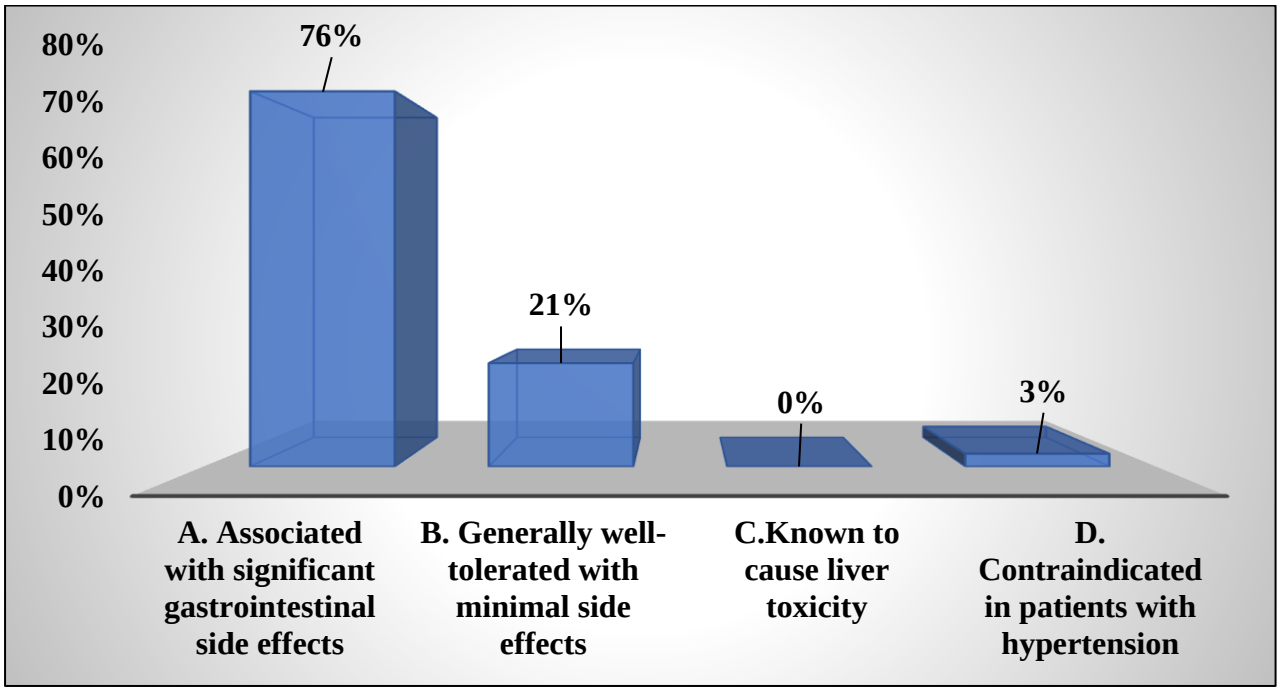
14.According to you, which statement (among the following) describes the safety profile of Myo- inositol?

A. Associated with significant gastrointestinal side effects

B. Generally well-tolerated with minimal side effects

C. Known to cause liver toxicity

D. Contraindicated in patients with hypertension



- **Associated with significant gastrointestinal side effects (76%):** The majority believe Myo-inositol is associated with significant gastrointestinal side effects.
- **Generally well-tolerated with minimal side effects (21%):** Some consider it generally well-tolerated with minimal adverse effects.
- **Known to cause liver toxicity (0%):** No respondents associate Myo-inositol with liver toxicity.
- **Contraindicated in patients with hypertension (3%):** A small percentage believe it is contraindicated in hypertension.

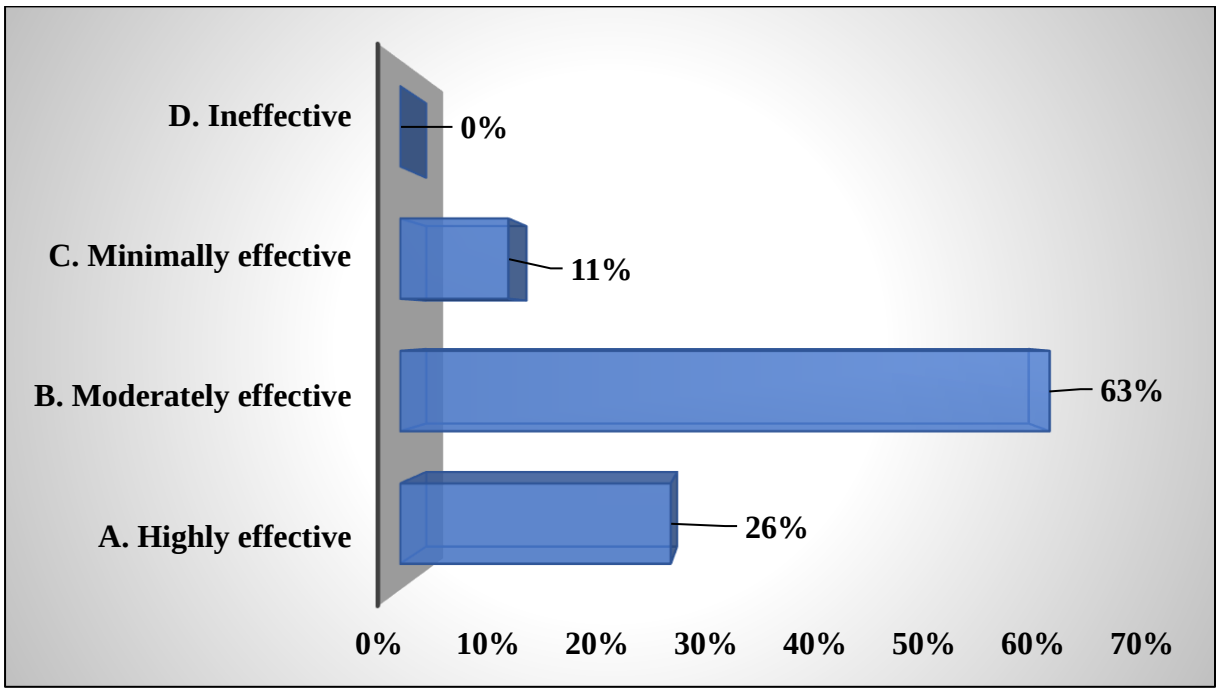
15.As per your clinical experience, how effective is Myo-inositol in managing anxiety and depression?

A. Highly effective

B. Moderately effective

C. Minimally effective

D. Ineffective



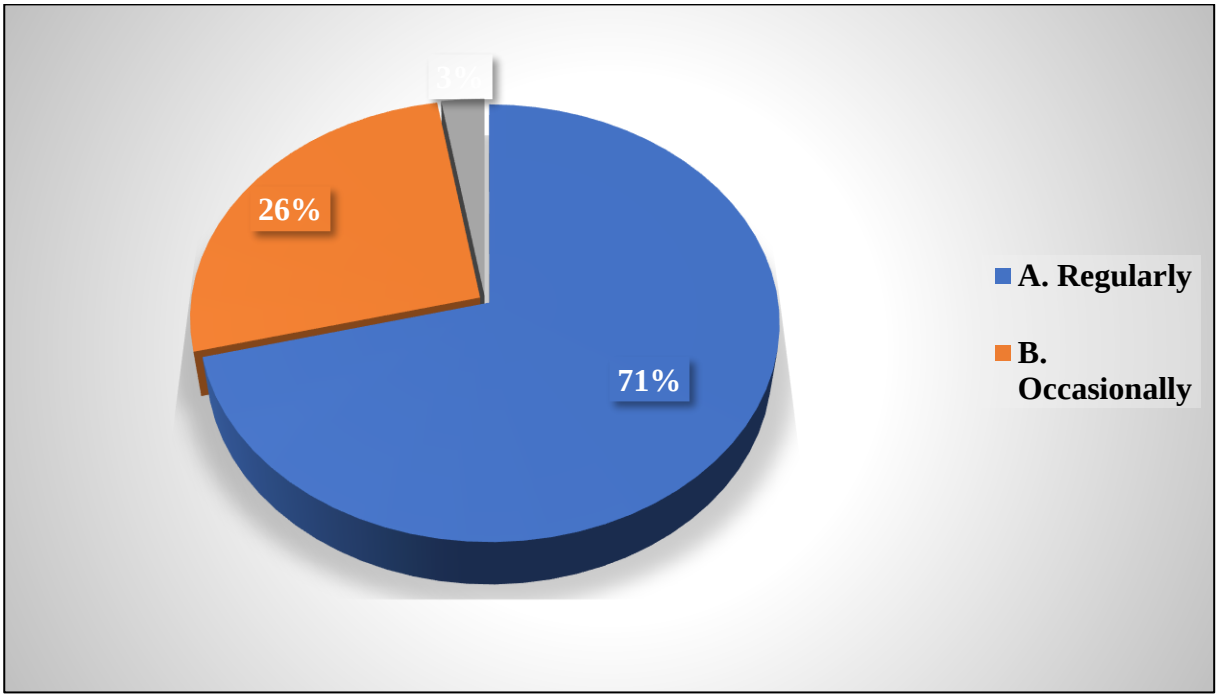
- **Highly effective (26%):** A minority find Myo-inositol highly effective in managing anxiety and depression.
- **Moderately effective (63%):** The majority report it as moderately effective.
- **Minimally effective (11%):** A smaller percentage find it minimally effective.
- **Ineffective (0%):** None consider it ineffective for managing anxiety and depression.

16.How frequently do you prefer to prescribe the nutritional supplements like Chromium Polynicotinate, Selenium, and Benfotiamine for overall health improvement?

A. Regularly

B. Occasionally

C. Rarely



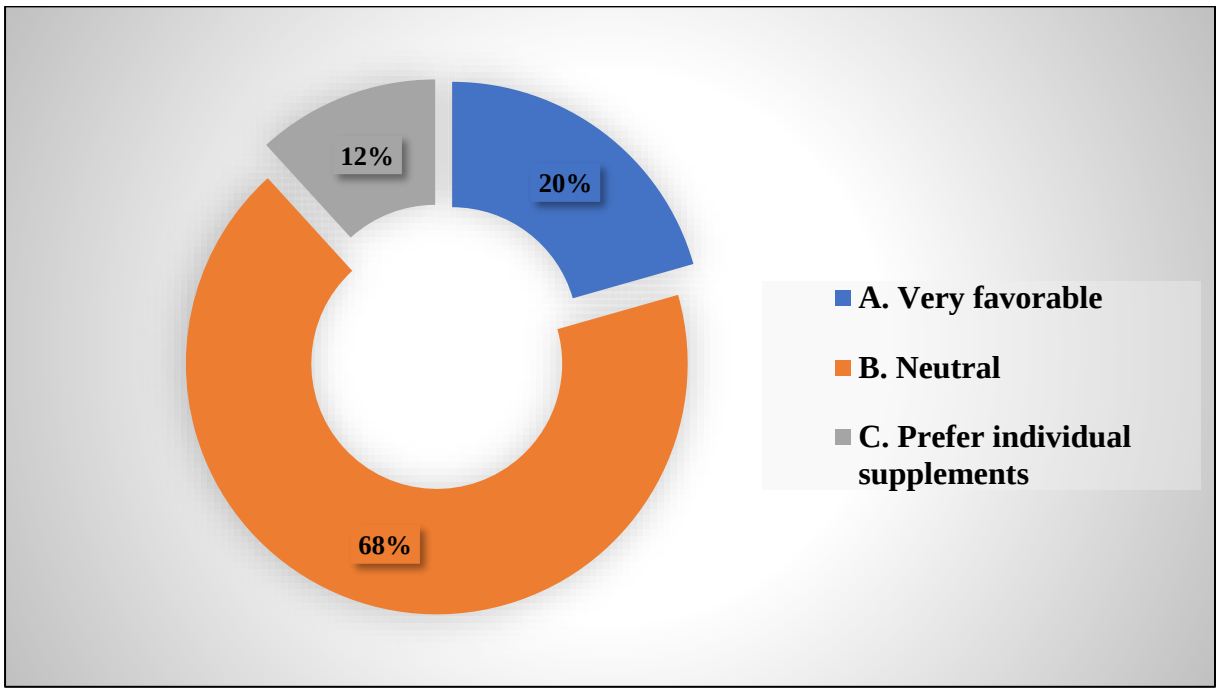
- **Regularly (71%):** The majority prefer to prescribe these nutritional supplements regularly for overall health improvement.
- **Occasionally (26%):** Some prescribe them occasionally based on specific needs.
- **Rarely (3%):** A small percentage prescribe them rarely.

17. What are your thoughts on combining multiple nutrients in a single capsule like Benfotiamine and Chromium Polynicotinate for patient convenience and compliance?

A. Very favorable

B. Neutral

C. Prefer individual supplements



- **Very favorable (21%):** A minority find combining multiple nutrients in a single capsule highly favorable for patient convenience and compliance.
- **Neutral (68%):** The majority hold a neutral stance on this approach.
- **Prefer individual supplements (12%):** A smaller percentage prefer prescribing nutrients as individual supplements.

18. In your experience with patients suffering from neuropathic pain, which component of the drug combinations provides the most significant relief in pain?

A. Methylcobalamin

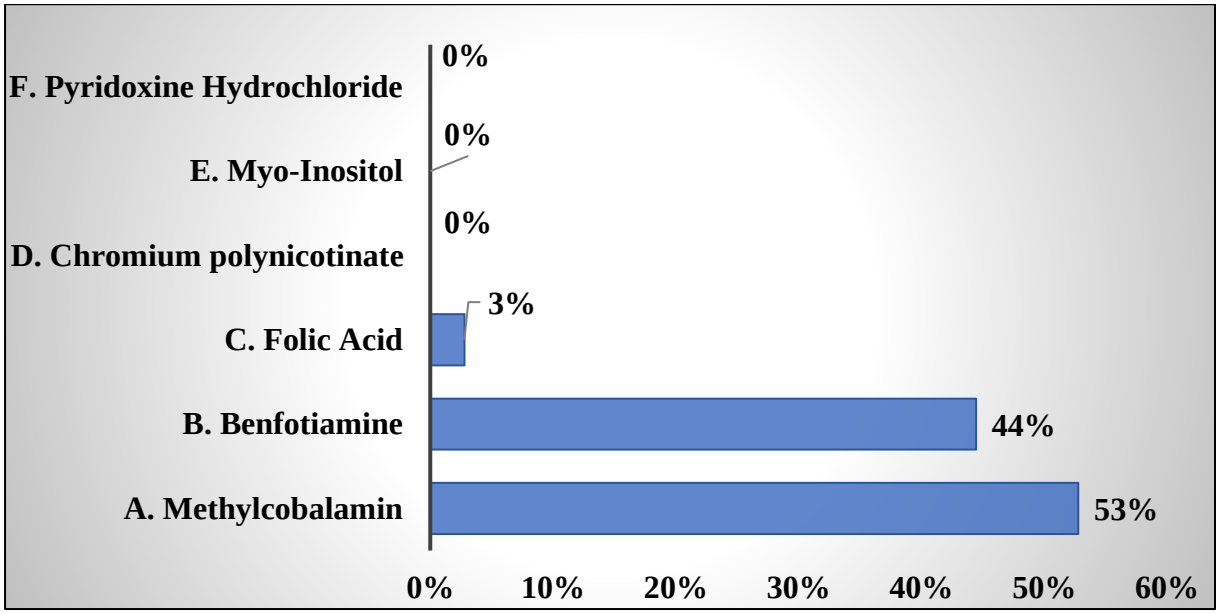
B. Benfotiamine

C. Folic Acid

D. Chromium polynicotinate

E. Myo-Inositol

F. Pyridoxine Hydrochloride



- **Methylcobalamin (53%):** The majority believe Methylcobalamin provides the most significant relief in neuropathic pain.
- **Benfotiamine (44%):** A substantial percentage find Benfotiamine highly effective in relieving pain.
- **Folic Acid (3%):** A small percentage attribute pain relief to Folic Acid.
- **Chromium Polynicotinate (0%), Myo-Inositol (0%), Pyridoxine Hydrochloride (0%):** None report these components as providing significant pain relief.

19.In your clinical practice, by what time do you observe noticeable improvement in pain relief in your patients suffering from neuropathic pain after starting the nutritional supplements?

A. Within 1 week

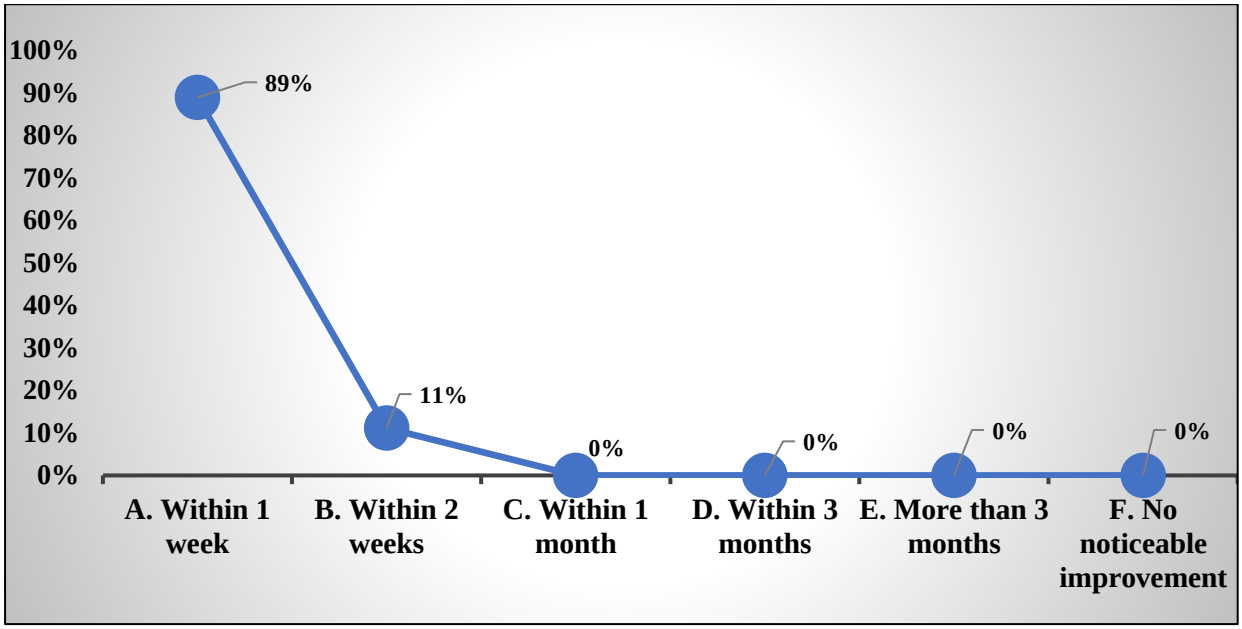
B. Within 2 weeks

C. Within 1 month

D. Within 3 months

E. More than 3 months

F. No noticeable improvement



- **Within 1 week (89%):** The majority observe noticeable improvement in neuropathic pain relief within 1 week of starting nutritional supplements.
- **Within 2 weeks (11%):** A smaller percentage notice improvements within 2 weeks.
- **Within 1 month (0%), Within 3 months (0%), More than 3 months (0%), No noticeable improvement (0%):** None report improvement taking longer or no improvement at all.

20. How would you rate the overall efficacy of the supplements combination in managing neuropathic pain compared to other standard drug treatments?

A. Much more effective

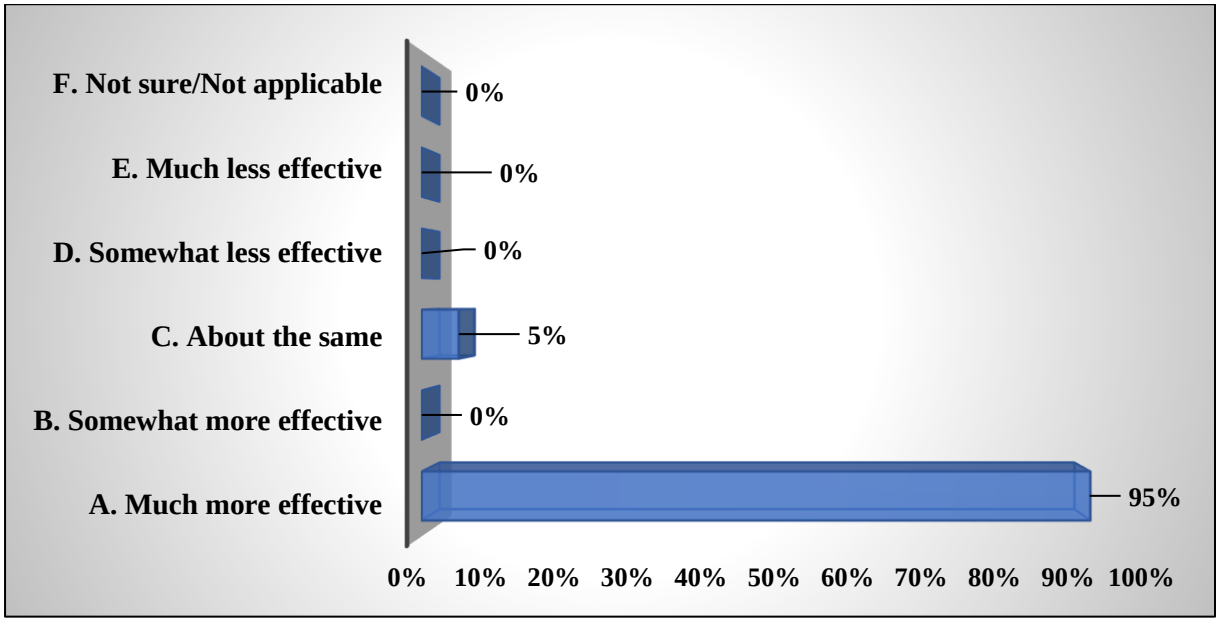
B. Somewhat more effective

C. About the same

D. Somewhat less effective

E. Much less effective

F. Not sure/Not applicable



- **Much more effective (95%):** The vast majority rate the supplement combination as much more effective in managing neuropathic pain compared to standard drug treatments.
- **Somewhat more effective (0%), About the same (5%), Somewhat less effective (0%), Much less effective (0%), Not sure/Not applicable (0%):** Very few report the supplements as less effective or about the same as standard treatments, with most showing a strong preference for their efficacy.

SUMMARY

This data highlights the clinical experiences and opinions regarding the use of nutritional supplements for managing neuropathic pain and neurodegenerative diseases.

- **Effectiveness of Nutritional Supplements:** A majority of clinicians (46%) find nutritional supplements moderately effective for managing conditions such as neuropathic pain and neurodegenerative diseases, with 35% rating them as very effective. Only 3% consider them ineffective.
- **Safety Profile:** Most clinicians (84%) believe these supplements are generally safe, with minimal side effects. However, 16% consider them to require careful monitoring due to moderate side effects.
- **Specific Benefits of Methylcobalamin:** Many clinicians attribute Methylcobalamin's effectiveness to its role in enhancing myelin sheath formation (50%), and some believe it inhibits protein aggregation in neurons (29%). Additionally, 24% believe it helps balance anxiety and depression symptoms.
- **Benfotiamine and Neurodegenerative Diseases:** Benfotiamine is commonly prescribed (76%) for supporting neurodegenerative disease management, with 66% observing significant improvements in nerve function tests. The majority (58%) report it markedly reduces neuropathic

pain in diabetic patients, and 89% of clinicians see improvements in neuropathic symptoms within a few days.

- **Chromium Polynicotinate:** Clinicians mostly attribute its benefits to reducing beta-amyloid plaque formation (53%) and inhibiting tau protein aggregation (25%) in neurodegenerative diseases.
- **Myo-Inositol:** Prescribed for neurodegenerative diseases as an adjunctive therapy (17%), Myo-Inositol is considered moderately effective for managing anxiety and depression by 63% of clinicians.
- **Prescription Trends:** Nutritional supplements are prescribed regularly by 71% of clinicians. Combining multiple nutrients in a single capsule is seen as favorable by 21% for convenience and compliance, though 68% remain neutral on the approach.
- **Pain Relief and Comparative Effectiveness:** 95% of clinicians rate the combination of nutritional supplements as much more effective than standard drug treatments in managing neuropathic pain, with most patients experiencing noticeable relief within a week.
- **Safety Concerns and Contraindications:** Myo-Inositol is associated with significant gastrointestinal side effects in 76% of clinicians, but it is generally well-tolerated by 21%.

In conclusion, nutritional supplements such as Methylcobalamin, Benfotiamine, Chromium Polynicotinate, and Myo-Inositol are considered effective for

managing neuropathic pain and neurodegenerative diseases. These supplements are widely used, with high clinician confidence in their efficacy and safety.

DISCUSSION

Based on the survey data, The survey reveals that nutritional supplements like Methylcobalamin, Benfotiamine, and Chromium Polynicotinate are increasingly being used for managing neuropathic pain and neurodegenerative diseases, particularly in patients who do not respond well to conventional treatments. Most clinicians find these supplements moderately to highly effective, with Methylcobalamin playing a significant role in supporting nerve health and Benfotiamine offering benefits for both neuropathic pain and neurodegenerative conditions. The safety profile of these supplements is generally favorable, with mild gastrointestinal side effects being the most common issue, which requires monitoring. High patient satisfaction and regular prescribing further indicate their growing acceptance in clinical practice. These supplements are positioned as valuable alternatives or adjunct therapies to traditional treatments, with strong market potential. Future research to refine their use and improve formulations could expand their role in neurological care, making them promising options for patients with unmet medical needs.

CLINICAL RECOMMENDATIONS

- **Integration into Treatment Plans**: Nutritional supplements like Methylcobalamin, Benfotiamine, Chromium Polynicotinate, and Myo-Inositol should be integrated into treatment plans for patients with neuropathic pain, neurodegenerative diseases, and associated anxiety or depression. These supplements are particularly beneficial for patients who have not responded well to traditional drug therapies or those with contraindications to certain medications.

- **Dosage Guidance**: Clinicians should follow the recommended dosages for each supplement, adjusting as needed based on patient response and tolerability. For Benfotiamine, the typical dose is 300 mg/day, while Methylcobalamin is often prescribed at 500-1000 mcg/day. Chromium Polynicotinate can range from 200-1000 mcg/day, and Myo-Inositol is generally given at 2-4 grams/day for anxiety and neuropathy.

- **Monitoring and Management**: Patients should be monitored for side effects, particularly gastrointestinal issues with Myo-Inositol and dizziness or drowsiness with Methylcobalamin. Regular assessments of nerve function should be done, especially for patients on Benfotiamine and Methylcobalamin, to evaluate improvements in nerve conduction and pain

relief. Appropriate management strategies should be implemented to address side effects.

- **Patient Education**: Educate patients about the benefits of these supplements, particularly in improving nerve health, symptom relief from neuropathy, and their role in neurodegeneration management. Provide information on potential side effects and the importance of adherence to the prescribed regimen to achieve the best possible outcomes.

CONSULTANT OPINION

Expert consultants generally view the combination of nutritional supplements, including Methylcobalamin, Benfotiamine, Chromium Polynicotinate, and Myo-Inositol, favorably for managing neuropathic pain and neurodegenerative conditions. They highlight the effectiveness of these supplements, especially Methylcobalamin and Benfotiamine, in relieving symptoms and improving nerve function. Consultants recommend that further research be conducted to validate the long-term efficacy and safety of these combinations in clinical practice.

MARKET OPPORTUNITIES

Unmet Medical Needs: A significant portion of clinicians (60%) find current treatments for neuropathic pain and neurodegenerative diseases inadequate,

presenting an opportunity for nutritional supplements as a valuable alternative. The efficacy of supplements in managing conditions like diabetic neuropathy and neurodegenerative diseases positions them as a solution for patients who are unresponsive to conventional treatments.

High Prescription Rate: The widespread use of these nutritional supplements (100% of clinicians have prescribed them) indicates strong market adoption, with 71% preferring regular prescription. This reflects confidence in their safety and efficacy profiles.

Patient Satisfaction and Effectiveness: With 60% of clinicians reporting supplements as "very effective" and 87% willing to recommend them to colleagues, the high levels of patient satisfaction and effectiveness suggest a promising market potential. This trend is supported by significant improvements in pain relief and neuropathic symptoms, especially within a few days of starting therapy.

Rapid Onset of Action: The rapid improvement observed by 89% of clinicians within one week of treatment offers a competitive edge for these supplements in the market. This quick onset aligns with the need for fast-acting solutions for conditions like neuropathic pain and neurodegenerative diseases.

Differentiation from Triptans: The efficacy of these nutritional supplements, particularly Methylcobalamin and Benfotiamine, in managing neuropathic pain,

positions them as superior alternatives to traditional drug treatments. Their combination approach provides added value for patients who do not respond to standard therapies.

MARKET POSITIONING

Targeted Marketing to Clinicians: Marketing campaigns should emphasize the unique benefits of these nutritional supplements, particularly their ability to provide rapid relief and their non-invasive nature. Highlighting their use in managing conditions like diabetic neuropathy and neurodegenerative diseases could attract healthcare professionals seeking alternative treatments for their patients.

Educational Initiatives: Comprehensive educational programs targeting clinicians, such as webinars, continuing medical education (CME) modules, and peer-reviewed publications, will increase awareness of these supplements' clinical benefits. This could help establish them as.

Patient-Centric Approaches: Marketing strategies should focus on the positive real-world outcomes, such as patient testimonials and case studies, which demonstrate the efficacy of these supplements. Emphasizing the convenience of combining multiple nutrients in a single capsule will appeal to patients looking for simple, effective treatment options.

Strategic Pricing and Access: To maximize market reach, consider pricing strategies that make these supplements accessible to a wide patient population, while reflecting their clinical value. Collaborations with healthcare providers and insurance companies can further enhance patient access and affordability.

Competitive Analysis: Constant monitoring of competitors and emerging therapies will be essential for adapting marketing strategies and ensuring that these nutritional supplements maintain their competitive edge in the evolving market.

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