

CONSUMER BEHAVIOR ANALYSIS OF VARIOUS NDDS: LONG ACTING INJECTIONS AND NEUROPATHIC NANO GELS

Dissertation Submitted to



The IIHMR University, Jaipur

for the partial fulfilment for the award of the degree of

Master of Business Administration (MBA)

in

Pharmaceutical Management

By

Anil Sadashiv Hambarde

Under the Supervision and Guidance of

Dr. Saurabh Kumar

2024

Completion Certification

CERTIFICATE

This is to certify that **Mr. Anil Hambarde** in partial fulfillment of the requirements for the award of the degree of MBA (Pharmaceutical Management) from the IIHMR University, Jaipur has successfully completed his internship at **Torrent Pharmaceuticals, Ahmedabad** during April 22nd to June 30



Mr. Ashish Chourasia

AGM, Axon Division

(Organisation Mentor)

Torrent Pharmaceutical,

Ahmedabad.

Date: 28/6/24

DECLARATION BY STUDENT

I hereby declare that this dissertation titled “Consumer Behavior Analysis Of Physicians towards Various NDDS: Long Acting Injections And Neuropathic Nanogels” is the bonafide record of my original research work. I declare that it has not been submitted to any other university institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



Mr. Anil Hambarde

IIHMR-U/02/2022-24/0370

MBA PM-14

Date : 29/06/2024

place : jaipur

Certificate from Faculty Guide and School Dean

CERTIFICATE

This is to certify that dissertation titled “**Consumer Behavior Analysis Of Various NDDS: Long Acting Injections And Neuropathic Nanogels.**” is a record of the research work undertaken by **Mr. Anil Hambarde** in partial fulfillment of the requirements for the award of the degree of MBA (Pharmaceutical Management) from the IIHMR University, Jaipur under my guidance and supervision and his approach to the research study has been sincere, scientific, and analytical.

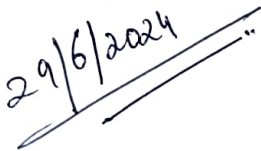


DR. SAURABH KUMAR BANERJEE

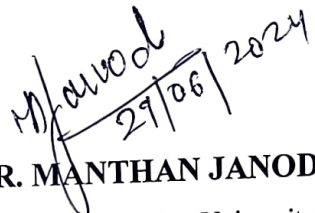
Faculty Guide

IIHMR University, Jaipur

Date:



29/6/2024



DR. MANTHAN JANODIA

Dean SPM, IIHMR University,

Jaipur

ABSTRACT

Title: Consumer Behavior Analysis Of Various NDDS: Long Acting Injections And Neuropathic Nanogels.

Author name: Anil Hambarde. *Advisor name:* Dr. Saurabh Kumar Banerjee.

Keywords: Antipsychotic; Depot; Long-Acting Injectable; Perceptions; Practitioner. 5.

Background: The pharmaceutical industry has witnessed significant advancements over the past few decades, particularly in the field of drug delivery systems. Traditional methods, such as oral tablets and capsules, although effective, often face challenges such as poor bioavailability, patient non-compliance, and systemic side effects. LAI are designed to release a drug gradually over a prolonged period, ranging from several days to several months. This method of delivery can maintain therapeutic drug levels in the bloodstream, minimizing the frequency of administration compared to daily oral medications.

Objective: Evaluate the level of awareness among consumers regarding longacting injections and neuropathic nanogels. Analyze consumer perceptions of these NDDS in terms of efficacy, safety, and convenience. Assess the costeffectiveness of long-acting injections.

Methodology: This study employs a mixed-methods approach to comprehensively analyze consumer behavior towards Novel Drug Delivery Systems (NDDS), focusing specifically on long-acting injections and neuropathic nanogels. The research methodology encompasses both quantitative and qualitative techniques to capture a nuanced understanding of consumer perceptions, attitudes, and experiences.

Results: Total of 76 Psychiatrists, Neurologists and Consultant Physicians was participated. 76 from which 77.63% physicians responded.. All the doctors were of Ahmedabad only.

Conclusion: In conclusion we can say that long acting injections can be recommended into schizoaffective disorders like schizophrenia and mood disorders. While prescribing LAI's, prescribers mostly concerns about its compliance followed by cost, safety and efficacy.

ACKNOWLEDGEMENT

I would like to sincerely thank and appreciate the following people and organisations for their guidance in finishing this thesis:

My mentor Mr. Ashish Chourasia Sir, AGM Axon Division, Ms. Shreya Madam, and whole axon team, Torrent Pharmaceuticals, Ahmedabad for their guidance, patience, and expertise throughout this research. Their invaluable advice and constructive feedback have been instrumental in shaping the direction and quality of this work.

The faculty and staff of IIHMR University, Jaipur, for providing a conducive environment for academic growth and research. I am grateful for the resources, facilities, and opportunities they have provided to further my knowledge and skills.

Secondly, I would like to express my gratitude to Dr. Prahlad Rai Sodani, President of IIHMR University, Jaipur for encouraging me to take this dissertation. Also, I am extremely thankful to my faculty guide Dr. Saurabh Kumar Banerjee, (Dean and Associate professor, School of Pharmaceutical Management) for his valuable guidance, keen interest and encouragement throughout the completion of this project.

This internship has not only enriched me professionally but also on a personal level. Additionally, I would like to thank the organisation that has supported this research, I'm extremely thankful to Torrent Pharmaceuticals, Ahmedabad to give me honour in this study which has played a significant role in its successful completion.

Also, I would like to thank my friends & family who encouraged me throughout this time and helped me on every obstacle and for being my stressbusters, motivators and proof-readers.

Lastly, I would want to express my sincere gratitude to everyone who has helped with this work in any way, whether through discussions, reviews, or encouragement. Your contributions have been truly valuable and have shaped this thesis for the better.

Mr. Anil Hambarde

Date:

Place- Jaipur

TABLE OF CONTENT:

Sr. no	Content	Page no
01	Introduction	10, 11
02	Research Objectives	12
03	Significance Of Study	13, 14
04	Research Questions	15, 16
05	Research Methodology	17
06	Literature Review	18, 19
07	Methodology	20
08	Result	21, 22
09	Conclusion	23
10	Reference	24

INTRODUCTION

Background

The pharmaceutical industry has grown tremendously in the last few decades, especially in the supply chain. Traditional methods, such as oral and topical formulations, although effective, often face challenges such as poor bioavailability, patient non-compliance, systemic side effects and so on. In response to these limitations, new drug delivery systems (NDDS) have emerged as revolutionary approaches. LAIs and neuropathic nanogels have shown great promise, especially in the management of chronic conditions.

Long-term injections are designed to slowly dissolve the drug over a longer period of time, ranging from several days to several months. This route of administration can maintain therapeutic drug concentrations in the bloodstream, reducing the frequency of administration compared to daily oral medications. LAIs have been important in conditions such as in the treatment of schizophrenia, where a steady dose of medication is critical to managing symptoms and preventing relapse. Injections help maintain glucose control. The main advantages of LAI are improved patient compliance, decreased risk of nonadherence, and avoidance of peak and moderate adherence to complex metabolites the medications they take.

Neuropathic nanogels represent a new frontier in NDDS, utilizing nanotechnology to precisely deliver drugs to the site of action. These nanogels are particularly important in the treatment of neuropathic pain, which is often resistant to conventional treatments. Neuropathic pain caused by nerve damage caused by conditions such as diabetes, stroke, and chemotherapy can significantly affect quality of life. Nanogels contain therapeutic agents and can be released controlled at the site of nerve injury, provide targeted pain relief, and reduce systemic exposure and side effects. Non-invasive, topical applications of nanogels make them very attractive, especially for patients looking for an alternative to this type of oral or injectable therapy.

Effective communication between healthcare providers and patients is paramount in addressing these concerns and increasing NDDS acceptance. Educating patients about the benefits, side effects, and appropriate use of these birth control measures can reduce fear and build confidence. Furthermore, incorporating patient input into the design and development of NDDS can ensure that these programs align with patient needs and preferences, improving both satisfaction and adherence.

RESEARCH OBJECTIVES

- Evaluate the level of awareness among consumers regarding longacting injections and neuropathic nanogels.
- Analyze consumer perceptions of these NDDS in terms of efficacy, safety, and convenience.
- Assess the costeffectiveness of long-acting injections.

SIGNIFICANCE OF THE STUDY

Consumer behavioral demands for novel drug delivery systems (NDDS), especially long-term injectables and neuropathic nanogels, are increasingly important in today's healthcare landscape..

The significance of this study is multifaceted and includes the following aspects:

1. Enhancing Patient Outcomes
2. Improving Healthcare Delivery
3. Economic Implications
4. Addressing Barriers to Adoption
5. Shaping Future Research and Development
6. Fostering Patient-Centric Healthcare
7. Market Expansion and Commercial Success

RESEARCH QUESTION

Research questions for LAI's

- 1) What percentage of your patients with schizophrenia experience non-adherence to oral antipsychotics?
- 2) Do you agree that long acting injectibles significantly improves the treatment adherence in schizophrenia and bipolar disorders?
- 3) Do you consider switching to LAI's for patients who are non-adherent to oral antipsychotics?
- 4) How often do you recommend LAI for schizophrenia/bipolar disorders?
- 5) On a scale of 1 to 5, rate below factors on how much they influence your decision while prescribing an LAI's in schizophrenia?
- 6) Do you observe any preferences among patients in their acceptance to try LAI's?
- 7) Have you encountered any specific safety concerns or adverse events related to LAI's?
- 8) Does long acting injectibles can be recommended in your practice? If yes, in which indications?
- 9) Which other molecules can be introduced as LAI's?
- 10) Do you observe any logistical or practical obstacles that hinder the implementation of LAI's?
- 11) Do you have any suggestions, comments or concerns regarding LAI's?

Research question for Neuropathic Nanogels

- 1) Do you agree that nanogels significantly improves the treatment adherence in neurological disorders?
- 2) Do you consider switching to nanogels for patients who are non-adherent to other options?
- 3) How often do you recommend nanogels for neurological disorders?
- 4) On a scale of 1 to 5, rate below factors on how much they influence your decision while prescribing nanogels?
- 5) Do you observe any preferences among patients in their acceptance to try nanogels?
- 6) Have you encountered any specific safety concerns or adverse events related to nanogels?
- 7) Does nanogels can be recommended into some other indications?
- 8) Which new molecules can be introduced as nanogels?
- 9) Do you observe any logistical or practical obstacles that hinder the implementation of nanogels?
- 10) Do you have any suggestions, comments or concerns regarding nanogels?

RESEARCH METHODOLOGY

This study employs a mixed-methods approach to comprehensively analyze consumer behavior towards Novel Drug Delivery Systems (NDDS), focusing specifically on long-acting injections and neuropathic nanogels. The research methodology encompasses both quantitative and qualitative techniques to capture a nuanced understanding of consumer perceptions, attitudes, and experiences.

Quantitative Phase: A structured questionnaire will be developed to gather quantitative data from a sample of consumers. The questionnaire will include items related to demographics, awareness of NDDS, perceptions of efficacy and safety, factors influencing acceptance, and satisfaction with traditional drug delivery methods versus NDDS.

Data Analysis: Qualitative data from interviews and focus groups will be analyzed thematically to identify key themes, patterns, and variations in consumer responses. Integration of quantitative and qualitative findings will enable a comprehensive understanding of consumer behavior towards NDDS, highlighting convergent and divergent insights across different data sources.

Ethical Considerations: Measures will be implemented to protect participant privacy and confidentiality throughout the data collection and analysis process.

By employing a mixed-methods approach, this research aims to provide robust insights into consumer behavior towards long-acting injections and neuropathic nanogels, contributing to the development of targeted strategies to enhance their acceptance and adoption in clinical practice.

LITERATURE REVIEW

Introduction

Schizophrenia affects around 20 million people worldwide, leading to significant disability and higher mortality rates. Antipsychotic medications can help reduce hospitalizations and deaths, especially after the first psychotic episode. However, many patients stop taking these medications within a few months, increasing their risk of relapse. Long-acting injectables (LAIs) are as effective as oral medications and offer better control of psychotic symptoms. They may improve treatment adherence and lead to better.

A early-phase schizophrenia patients using aripiprazole LAI had a significantly lower time to first hospitalization compared to those receiving standard treatment. Caregivers in the have reported a reduction in related hospitalizations in 63% of patients on LAIs, compared to 35% on oral medications. Despite evidence supporting their early use in treatment, LAIs are often reserved for more severe cases or when patients have not adhered to oral medications.

The latest guidelines from the American Psychiatric Association recommend LAIs based on patient preference or previous non-adherence to treatment. In 2019, about 10% of schizophrenia patients in the U.S. were on LAIs. A 2018 survey of psychiatric pharmacists found that 41% believed LAIs were underused. In India, a study also, citing cost, lack of patient interest, availability, and patient reluctance as common reasons.

Several include among accessibility issues and logistics. patient acceptance of LAI treatment. A review of studies from 1966 to 1999 towards LAIs among, a finding supported by more recent

studies in the UK and South Africa. Patients who switched from oral to LAI treatment reported improved well-being and quality of life.

Despite this, some clinicians overestimate patients' fears about LAIs. A survey revealed that many doctors and nurses did not discuss LAIs with half of the patients on oral antipsychotics who might benefit from a change in treatment. aimed to explore perceptions of, barriers to use, and usage patterns. It also looked at how factors like age, gender, in affect these perceptions. Better understanding these factors can help improve access to LAIs and patient outcomes.

METHODOLOGY

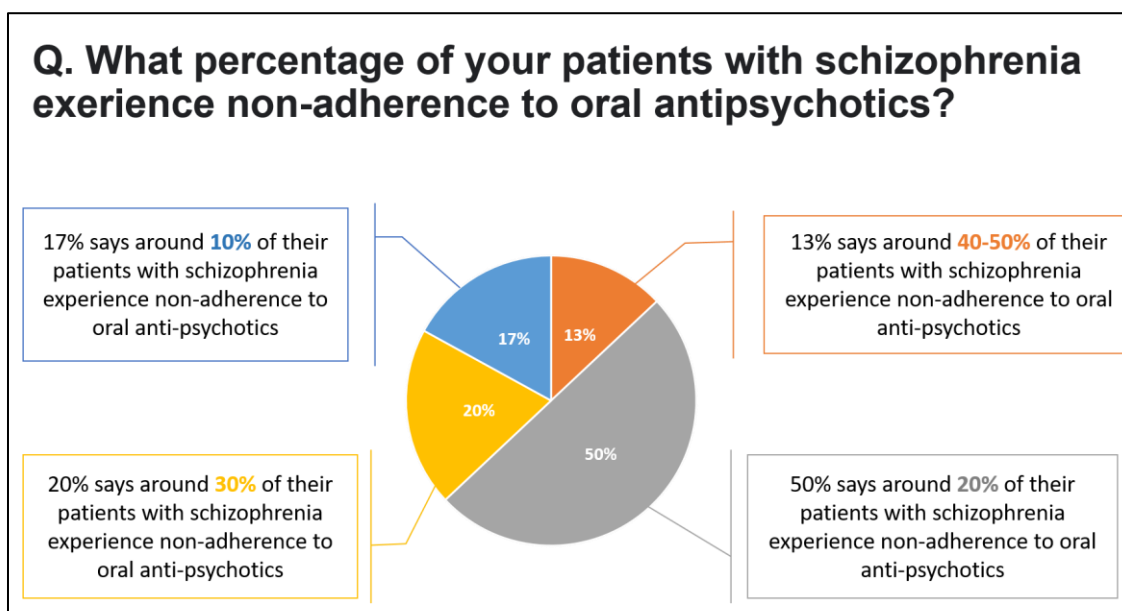
A market survey was created to evaluate health practitioners' views on LAI-A usage rates, patient acceptance, and barriers to use. This survey was a physical multiple-choice questionnaire. It gathered and asked practitioners to estimate the percentage of their patients willing to use LAIs. Likert scales were used to gauge their perceptions of LAI use in their practice, their profession, and their personal practice, as well as the impact of various barriers to LAI use.

Participants had to agree to a consent statement before answering. Data were anonymized and analyzed using descriptive statistics. Subgroup analysis was conducted to examine.

RESULTS

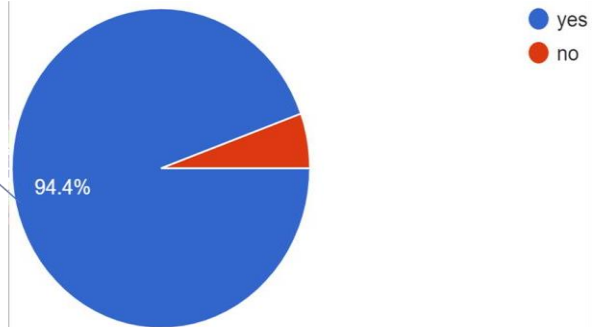
A total of 76 psychiatrists, neurologists, and consultant physicians from Ahmedabad were contacted to complete the survey. During the distribution period, 76 attempts were made to complete the survey, resulting in a response rate of 77.63%. Any survey in which at least one question was answered was considered an attempt.

Survey Result Of Long Acting Injections (LAI'S):



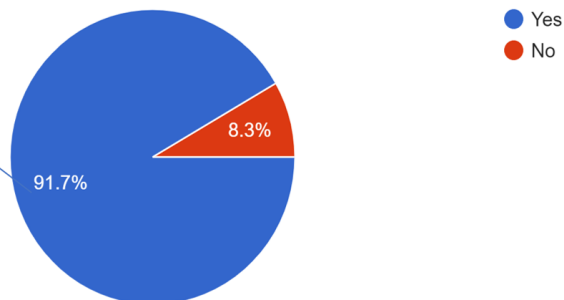
Q. Do you agree that long acting injections significantly improves the treatment adherence in schizophrenia and bipolar disorders?

More than **94%** doctors agrees that LAI's significantly improves the treatment adherence in schizophrenia & bipolar disorders



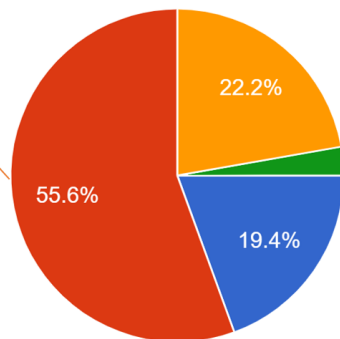
Q. Do you consider switching to LAI's for patients who are non-adherent to oral antipsychotics?

More than **91%** doctors consider switching to LAI's for patients who are non-adherent to oral antipsychotics



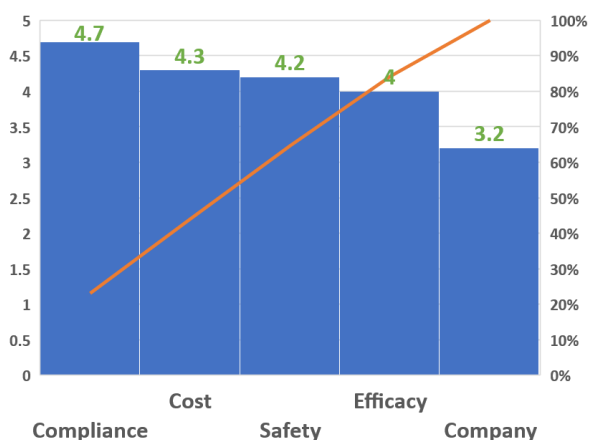
Q. How often do you recommend LAI for schizophrenia / bipolar disorders?

More than 55% of doctors occasionally recommend LAI for schizophrenia / bipolar disorders due to higher prices



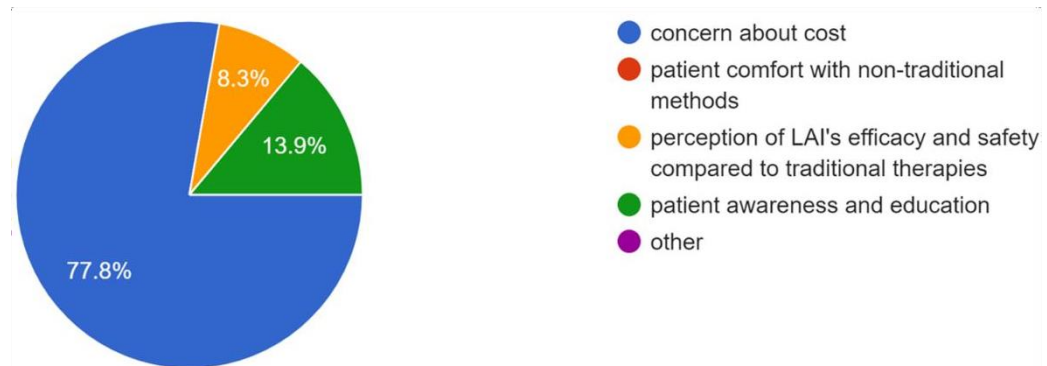
- Frequently
- Occasionally
- Rarely
- never

Q. On a scale of 1 to 5, rate below factors on how much they influence your decision while prescribing an LAI in schizophrenia? (efficacy, safety, compliance, cost, company)

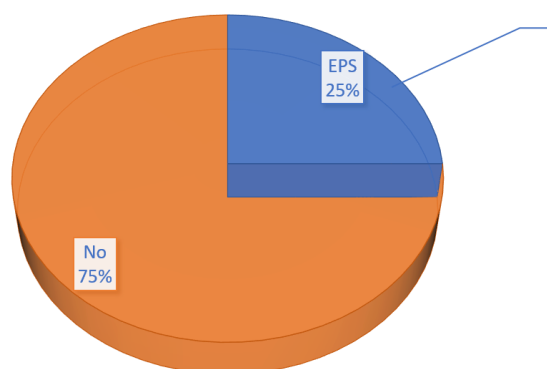


While prescribing LAI's doctors rated compliance as the main factor to consider followed by cost, safety, efficacy and company

Q.Do you observe any preference among patients in thier acceptance to try LAI's?

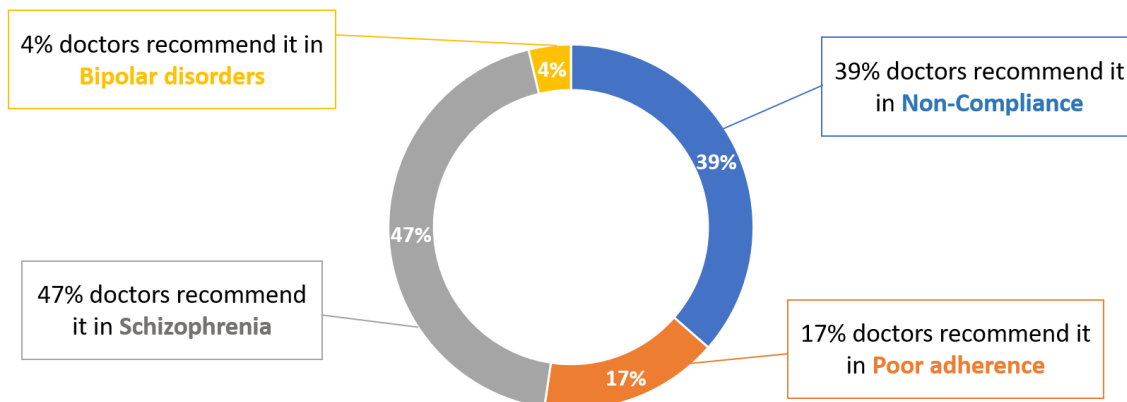


Q. Have you encountered any specific safety concerns or adverse events related to LAI's?

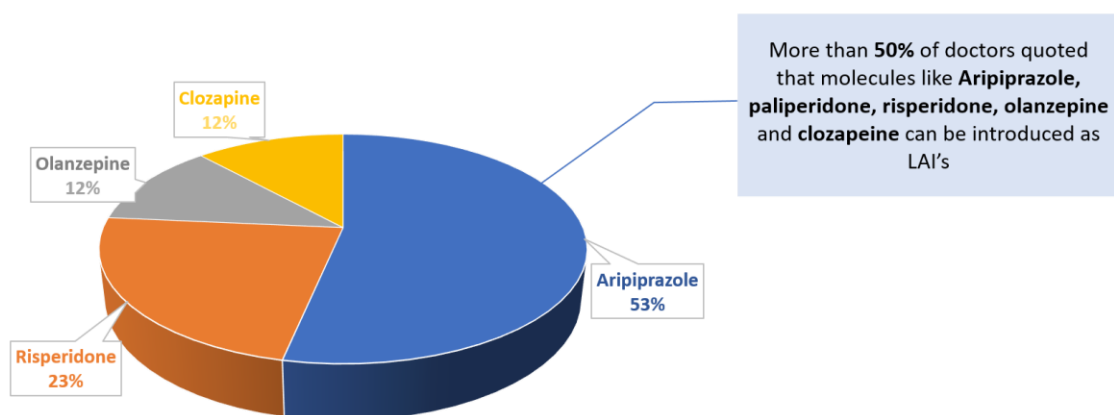


Around 25% od doctors observed side effects such as Extrapyramedal symptoms after prescribing LAI's

Q. Does LAI's can be recommended in your practice? if yes, in which indications?

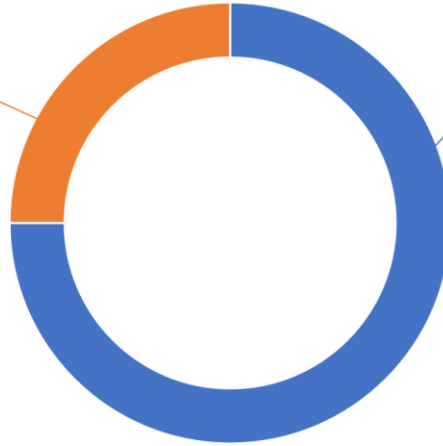


Q. Which molecules can be introduced as LAI's?



Q. Do you observe any logistical or practical obstacles that hinder the implementation of LAI's?

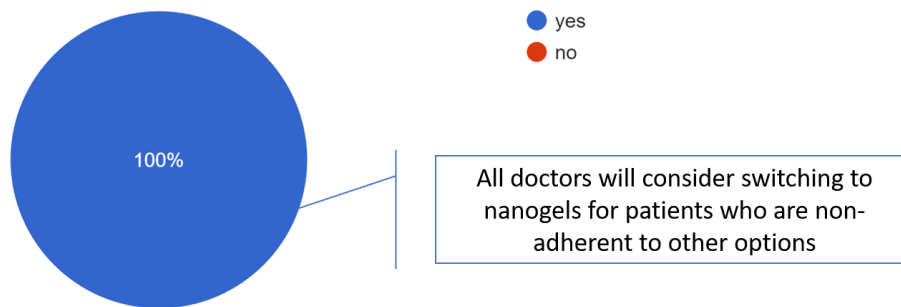
25% of doctors feel the limited **availability** of LAI's hinder its implementation.



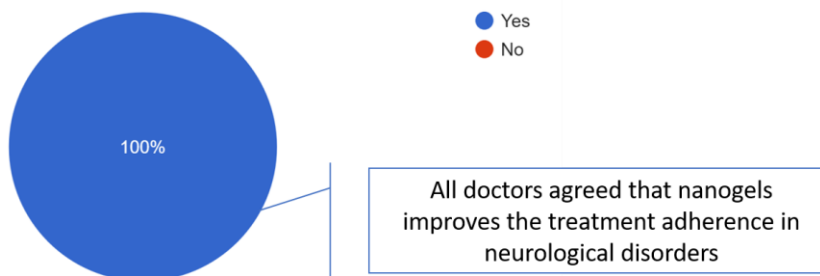
75% of doctors feel that **cost** of LAI's hinder its implementation.

Survey Result Of Neuropathic Nanogels:

Q. Do you consider switching to nanogels for patients who are non-adherent to other options?

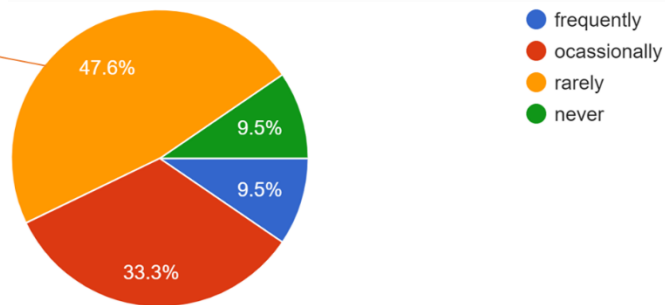


Q. Do you agree that nanogels significantly improves the treatment adherence in neurological disorders?

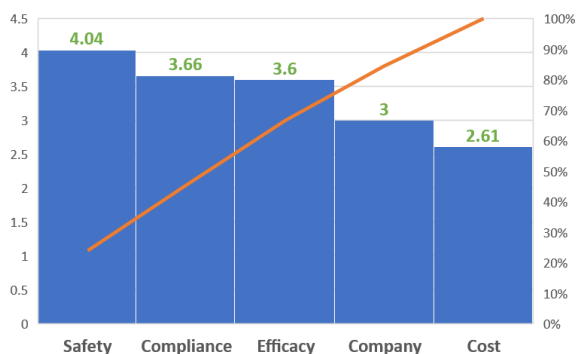


How often do you recommend nanogels for neurological disorders?

More than 47% of doctors rarely recommend nanogels due to its limited awareness.

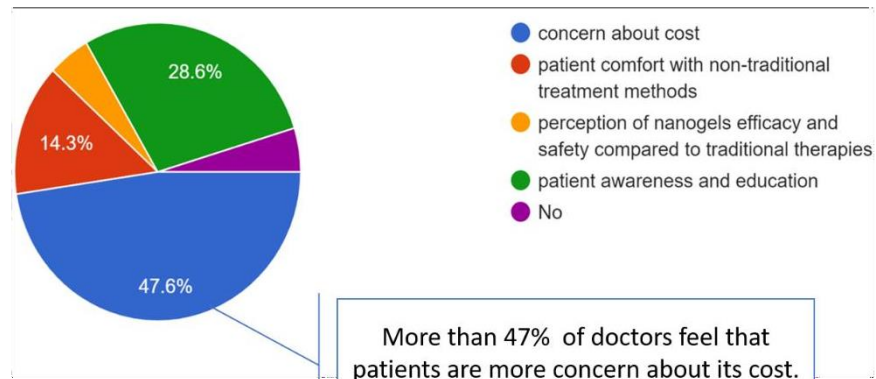


Q. On a scale of 1 to 5, rate below factors on how much they influence your decision while prescribing a nanogel? (efficacy, safety, compliance, cost, company)

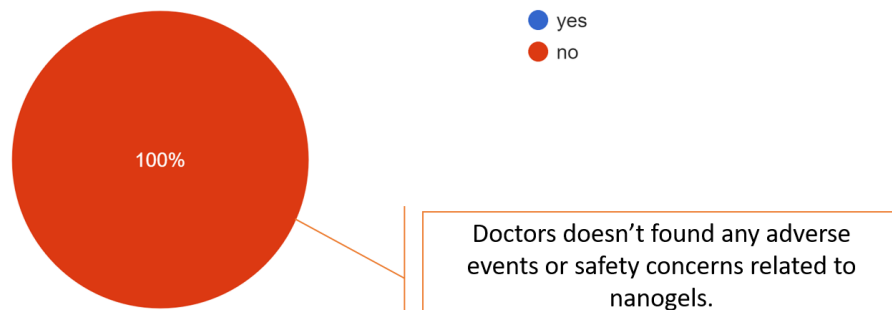


While prescribing nanogel doctors rated **safety** as the main factor to consider followed by compliance, efficacy, company and cost.

Q. Do you observe any preference among patients in their acceptance to try nanogels?



Q. Have you encountered any safety concerns or adverse events realated to nanogels?



CONCLUSION

In conclusion we can say that long acting injections can be recommended into schizoaffective disorders like schizophrenia and mood disorders. And On an average 20-30% of Patients with schizophrenia experience non-adherence to oral anti-psychotics. While prescribing LAI's, prescribers mostly concerns about its compliance followed by cost, safety and efficacy. Most of the patients are concerned about cost of LAI's, as compared to oral drugs. common side effects observed in LAI's is EPS (extrapyramidal symptoms). Aripiprazole, Paliperidone & Risperidone are the anti-psychotics which can be introduced into LAI's. And the high pricing of LAI's as compared to oral anti-psychotics is the only factor that hinders the implementation of LAI's.

While talking about neuropathic nanogels the neurologists and consultant physicians agreed that nanogels improves the treatment adherence in neurological disorders. neurologists will consider switching to nanogels for patients who are non-adherent to other options. While prescribing nanogels doctors rated safety as the main factor to consider followed by compliance, efficacy, company and cost. And more than 47% of neurologists feels that patients are more concern about its cost. Health care professionals doesn't found any adverse events or safety concerns related to nanogels.

REFERENCES

1. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet*. 2018;392(10159):1789–858. 10.1016/S0140-6736(18)32279-7 PubMed PMID: [30496104](#). [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]
2. Laursen TM, Nordentoft M, Mortensen PB. Excess early mortality in schizophrenia. *Annu Rev Clin Psychol*. 2014;10:425–48. 10.1146/annurev-clinpsy-032813-153657 PubMed PMID: [24313570](#). [[PubMed](#)] [[Google Scholar](#)]
3. Leucht S, Tardy M, Komossa K, Heres S, Kissling W, Salanti G, et al. Antipsychotic drugs versus placebo for relapse prevention in schizophrenia: a systematic review and meta-analysis. *Lancet*. 2012;379(9831):2063–71. 10.1016/S0140-6736(12)60239-6 PubMed PMID: [22560607](#). [[PubMed](#)] [[Google Scholar](#)]
4. Tiihonen J, Tanskanen A, Taipale H. 20-year nationwide follow-up study on discontinuation of antipsychotic treatment in first-episode schizophrenia. *Am J Psychiatry*. 2018;175(8):765–73. 10.1176/appi.ajp.2018.17091001 PubMed PMID: [29621900](#). [[PubMed](#)] [[Google Scholar](#)]
5. Fitzgerald HM, Shepherd J, Bailey H, Berry M, Wright J, Chen M. Characterization and treatment goals of patients on long-acting injectable vs oral antipsychotics: results from a patient/caregiver/psychiatrist survey [abstract] *CNS Spectr*. 2021;26(2):154. doi: 10.1017/s109285292000245x. [[CrossRef](#)] [[Google Scholar](#)]
6. Canady VA. Long-acting injectables good option for schizophrenia patients. *Ment Health Wkly*. 2019;29(15):6–7. doi: 10.1002/mhw.31861. [[CrossRef](#)] [[Google Scholar](#)]
7. Parellada E, Bioque M. Barriers to the use of long-acting injectable antipsychotics in the management of schizophrenia. *CNS Drugs*. 2016;30(8):689–701. 10.1007/s40263-016-0350-7 PubMed PMID: [27255405](#). [[PubMed](#)] [[Google Scholar](#)]