PREVALENCE RATE OF RARE DISEASE IN INDIA WITH SPECIAL FOCUS ON PAEDIATRIC RARE DISEASES AND CHALLENGES AND LIMITATIONS IN DRUG DEVELOPMENT AND TREATMENT.

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ABSTRACT

Background: Pediatric rare diseases, though individually uncommon, collectively represent a significant public health challenge in India. The majority are genetic, progressive, and life-limiting, with limited treatment options and high costs. Recent regulatory reforms, including the New Drugs and Clinical Trials Rules (NDCTR) 2019 and the National Policy for Rare Diseases (NPRD) 2021, aim to improve access to orphan drugs. However, the extent of clinician awareness and the real-world impact of these policies remain unclear.

Objective: To assess healthcare professionals' awareness of pediatric rare diseases, familiarity with India's regulatory framework and perceived barriers to diagnosis and treatment access.

Methods: A descriptive, cross-sectional survey was conducted among 50 healthcare professionals across five Indian states. A structured questionnaire captured demographic data, disease recognition patterns, knowledge of NDCTR 2019 and NPRD 2021 provisions, and perceived challenges in patient management. Quantitative data were analysed descriptively; qualitative responses underwent thematic analysis.

Results: While 92% of respondents were aware of the rare-disease concept, only 46% knew of the ₹50 lakh funding cap under NPTRD 2021, and 40% were aware of GST/customs duty exemptions. Spinal muscular atrophy (48%) and Duchenne muscular dystrophy (36%) were the most recognized conditions. Between 2021 and 2025, approximately 90 Indian children received Zolgensma through accelerated import permissions, compassionate-use programs, and crowdfunding.

Conclusion: Regulatory reforms have improved therapeutic availability, but policy literacy and sustainable financing remain critical challenges. Strengthening clinician education, expanding newborn screening, and developing innovative funding models are essential to bridge the gap between policy and practice.

Keywords: Rare diseases, Pediatrics, Spinal muscular atrophy, NDCTR 2019, NPRD 2021, India

Introduction

Rare diseases are defined in India as conditions affecting fewer than 1 in 2,500 individuals. Globally, over 7,000 rare diseases have been identified, with approximately 70% manifesting in childhood and 80% having a genetic basis. In India, the burden is compounded by high consanguinity rates in certain regions, limited genetic testing infrastructure, and fragmented referral pathways.

Pediatric rare diseases such as spinal muscular atrophy (SMA), Duchenne muscular dystrophy (DMD), and various inborn errors of metabolism often present with progressive disability, multisystem involvement, and high mortality if untreated. Early diagnosis is critical, yet delayed recognition is common due to low disease awareness, overlapping symptoms, and limited access to specialized diagnostics.

The NDCTR 2019 introduced provisions to expedite orphan drug approvals, including waivers for local clinical trials if the drug is already approved in certain reference countries. The NPTRD 2021 further established a funding mechanism of up to ₹50 lakh per patient for certain conditions, designated Centres of Excellence (CoEs), and outlined strategies for prevention, including prenatal and newborn screening.

Despite these policy advances, anecdotal evidence suggests that many healthcare professionals remain unaware of specific provisions, limiting their ability to guide families toward available support. This study aims to quantify awareness levels, identify the most recognized pediatric rare diseases, and explore perceived barriers to treatment access.

Methods

Study Design and Participants

A descriptive, cross-sectional survey was conducted between January and April 2025. Participants included pediatricians, neurologists, genetic counsellors, and allied health professionals from Tamil Nadu, Maharashtra, Delhi, Karnataka, and Kerala.

Inclusion criteria:

- Minimum of two years' clinical experience
- Direct involvement in pediatric care or rare-disease management

Sampling and Recruitment

Purposive sampling was used to ensure representation from both public and private sectors, as well as urban and semi-urban settings. Invitations were sent via professional networks, medical associations, and institutional contacts.

Data Collection Tool

A structured questionnaire was developed based on literature review and expert input. It comprised four sections:

1. **Demographics and practice setting**
2. **Awareness of pediatric rare diseases** (open-ended and multiple-choice)
3. **Knowledge of NDCTR 2019 and NPTRD 2021 provisions**
4. **Perceived challenges in diagnosis and treatment access**

The questionnaire was pilot-tested with five clinicians for clarity and relevance.

Data Analysis

Quantitative data were analyzed using descriptive statistics (frequencies, percentages). Qualitative responses were coded thematically to identify recurring patterns in perceived barriers and suggestions.

Results

Participant Characteristics

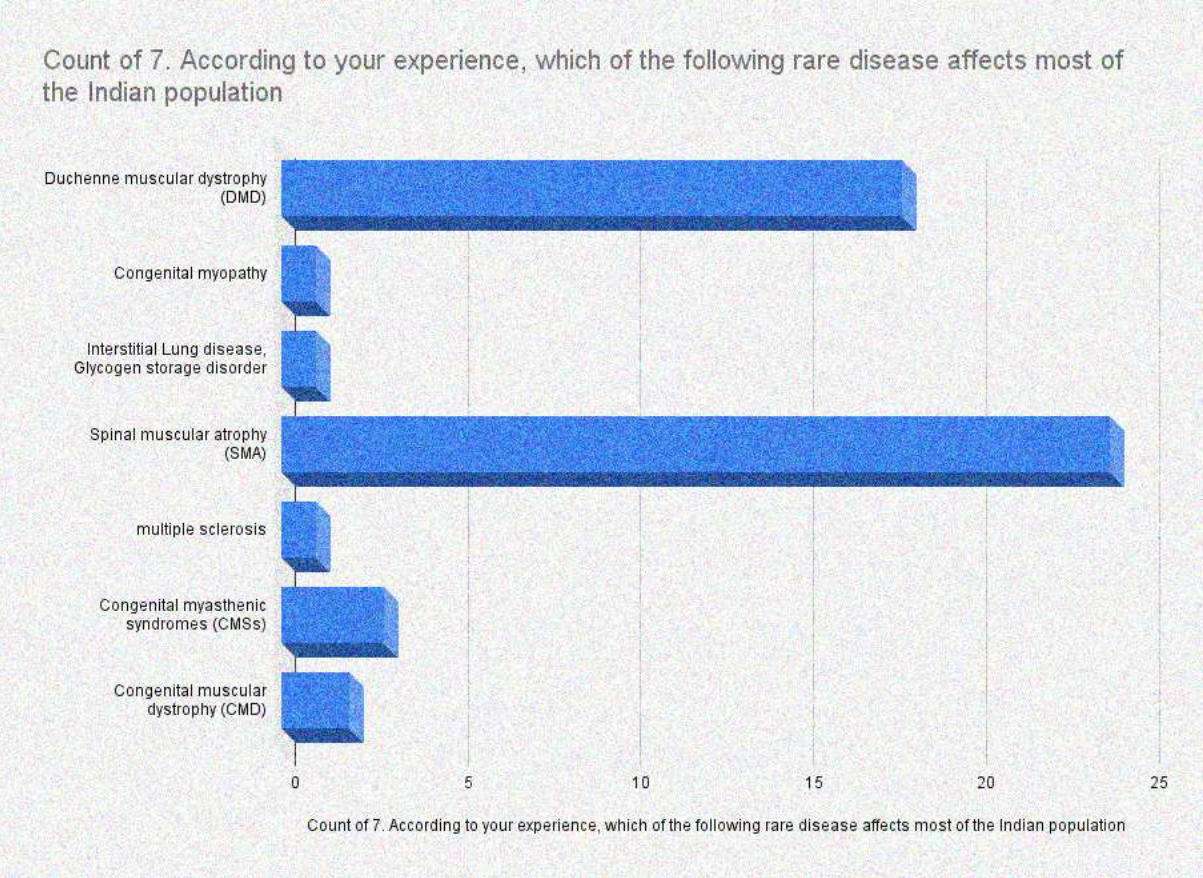
Of the 50 respondents, 20 (40%) were pediatricians, 15 (30%) neurologists, 10 (20%) genetic counsellors, and 5 (10%) allied health professionals. Forty-two percent had more than 10 years of clinical experience. Most (68%) worked in tertiary or academic hospitals, with the remainder in secondary-level facilities or private clinics.

Disease Recognition

General awareness of the rare-disease concept was high (92%). SMA was the most frequently recognized condition (48%), followed by DMD (36%). Metabolic disorders (6%) and congenital myopathies (4%) were less frequently mentioned.

Policy Awareness

NPTRD 2021 Provision	Aware (%)	Not aware/Unsure (%)
Policy existence	80	20
Centres of Excellence	52	48
₹50 lakh funding cap	46	54
GST/customs duty exemption	40	60
Gestational prevention strategies	56	44



Treatment Access

Between 2021 and 2025, approximately 90 children received **Zolgensma** through:

- NDCTR 2019–enabled accelerated import permissions
- Novartis Managed Access Program
- Crowdfunding and partial state/NPRD subsidies

Risdiplam adoption increased gradually but remained limited by cost and clinician awareness.

Discussion

This study reveals a critical gap between general awareness of rare diseases and detailed knowledge of regulatory provisions. While most respondents could identify at least one pediatric rare disease, fewer than half were aware of key NPTRD 2021 funding mechanisms or tax exemptions.

The predominance of SMA and DMD recognition likely reflects strong advocacy efforts, media coverage, and the availability of high-profile therapies. However, the low recognition of metabolic disorders suggests a need for broader educational outreach.

The finding that only ~90 children received Zolgensma over four years underscores both the success of regulatory flexibility and the persistent inequities in access. High costs, limited CoE distribution, and reliance on crowdfunding remain major barriers.

SMA Treatment Access in India (2021–2025)

Year	NPTRD Beneficiaries (All RDs)	Estimated SMA Patients Receiving Therapy	Main Therapies Used	Funding Sources
2021–22	~200+	<10	Risdiplam, Zolgensma	Crowdfunding, pharma compassionate access, partial NPRD

Year	NPTRD Beneficiaries (All RDs)	Estimated SMA Patients Receiving Therapy	Main Therapies Used	Funding Sources
2022–23	~203	~15–20	Risdiplam Zolgensma	NPRD, state schemes, crowdfunding
2023–24	~900+	~30–35	Risdiplam, Zolgensma	NPRD, Kerala KARE, Delhi HC orders, NGO/pharma donations
2024–25	1,118	~40–50	Risdiplam, Zolgensma	NPRD, central/state funds, crowdfunding

Regulatory Provisions for Approval of New Drug including Rare Disease

Requirements and guidelines for permission to Import and / or Manufacture of new drugs for sale are specified in New Drugs and Clinical Trials Rules, 2019 of Drugs and Cosmetics Rules, 1945.

Rules 74	Regulation of new drug
Rules 75	Application for permission to import new drug for sale or distribution
Rules 76	Grant of permission for import of new drugs for sale or distribution
Rules 77	Condition of permission for import of new drugs for sale or distribution
Rules 78	Suspension or cancellation of import permission for new drug
Rules 79	Licence to import new drug for sale or for distribution under the Drugs and Cosmetics Rules, 1945
Rules 80	Application for permission to manufacture new drug for sale or distribution
Rules 81	Grant of permission for manufacture of new drug for sale or distribution
Rules 82	Condition of permission for manufacture of new drugs for sale or distribution
Rules 83	Licence to manufacture a new drug for sale or for distribution under Drugs and Cosmetics Rules, 1945
Rules 84	Suspension or cancellation of permission
Rules 85	Responsibility of importers or manufacturers in marketing of new drugs

Comparison with Literature

Similar gaps in policy literacy have been reported in other LMICs, where regulatory reforms outpace clinician awareness. Studies from Brazil and South Africa highlight the importance of integrating rare-disease policy education into medical curricula and CME programs.

Policy Implications

- **Education:** Incorporate NDCTR and NPTRD modules into pediatric and neurology training.
- **Screening:** Expand newborn screening programs to include treatable rare diseases.
- **Financing:** Explore pooled insurance schemes, outcome-based reimbursement, and public–private partnerships.
- **Registry Development:** Establish a national pediatric rare-disease registry to inform policy and research.

Future Scope

The findings of this study open multiple avenues for research, policy innovation, and clinical practice improvement:

1. **National Pediatric Rare Disease Registry**
    - Develop a centralized, interoperable registry integrating clinical, genetic, and outcome data.
    - Link registry data to funding allocation and policy evaluation metrics.
2. **Longitudinal Cohort Studies**
    - Track disease progression, treatment outcomes, and quality of life over time.
    - Identify prognostic biomarkers for earlier intervention.
3. **AI-Driven Diagnostics**
    - Deploy machine-learning models for early phenotypic recognition using imaging, EMR data, and genomic profiles.
    - Integrate AI tools into telemedicine platforms for rural outreach.
4. **Gene and RNA Therapy Readiness**
    - Assess regulatory pathways, manufacturing capacity, and ethical frameworks for CRISPR, base editing, and antisense oligonucleotide therapies.
    - Pilot outcome-based payment models for high-cost curative treatments.
5. **Health Economics and Financing Models**
    - Conduct cost-effectiveness and budget-impact analyses for orphan drugs in the Indian context.
    - Explore blended financing mechanisms involving government, insurers, and philanthropic organizations.
6. **Global Collaboration**
    - Participate in cross-border data-sharing consortia to harmonize diagnostic criteria and treatment protocols.
    - Leverage WHO and Rare Diseases International platforms for policy advocacy.

By pursuing these directions, India can move from reactive, case-by-case management toward a proactive, system-level approach that ensures timely diagnosis, equitable access, and sustainable care for children with rare diseases.

Conclusion

India’s regulatory reforms have created a more enabling environment for orphan-drug access, yet policy literacy and financing gaps persist. Bridging these gaps through targeted education, early detection, and innovative funding could significantly improve outcomes for children with rare

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