



Does Stronger IPR Protection Foster Innovation in Kashmir's Pharmaceutical Sector?

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Abstract

This study investigates whether stronger Intellectual Property Rights (IPR) protection fosters innovation in Kashmir's pharmaceutical sector. Using a quantitative research design, primary data were collected through structured questionnaires from professionals and stakeholders in the pharmaceutical industry, employing a convenience sampling technique. A total of 382 valid responses were analyzed using SPSS for descriptive and inferential statistics, while Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (CB-SEM) were employed to test the hypothesized relationships. The findings reveal a statistically significant positive relationship between the perceived strength of IPR protection and the level of innovation activities within the sector. The study also highlights key factors such as patent awareness, legal enforcement, and R&D investment that mediate this relationship. The results suggest that strengthening IPR frameworks can be a strategic lever for enhancing innovation in regional pharmaceutical ecosystems like Kashmir. The study contributes empirical evidence to policy debates on IPR reform and innovation-driven growth.

Keywords: Intellectual Property Rights, Innovation, Pharmaceutical Sector, CB-SEM

Introduction

Innovation is a critical driver of competitiveness and economic growth in the pharmaceutical industry. Intellectual Property Rights (IPRs) are designed to protect creations of the mind, thereby encouraging investment in research and development (R&D). In developing countries, the relationship between IPR protection and innovation is complex. While stronger IPRs can incentivize domestic innovation by safeguarding inventors' rights, they may also limit the diffusion of foreign technologies, potentially hindering local innovation efforts (Khouilla, 2024). India has made significant strides in reforming its IPR policies to foster innovation and entrepreneurship. The National Intellectual Property Rights Policy of 2016 aimed to create a conducive environment for creativity and protect IP rights (Gupta &



Bhattacharya, 2024). Despite these national-level initiatives, regional disparities persist in the innovation ecosystem. Patent filings, often used as a proxy for innovation, are predominantly concentrated in southern and western India, with Delhi being an outlier. This indicates that regions like Kashmir may not be fully participating in the country's innovation surge (Forbes India, 2024).

Intellectual Property Rights (IPRs) have long been recognized as a critical driver of innovation, particularly within knowledge-intensive sectors such as pharmaceuticals. Existing literature has extensively explored the impact of IPR protection on innovation at the national level and within industrialized economies where institutions are robust, markets are well-developed, and innovation ecosystems are well-established. These studies have shown that stronger IPR regimes often correlate with increased research and development (R&D) investments, improved technological advancement, and enhanced competitiveness among firms. However, these findings are not necessarily generalizable across all regions, especially those characterized by socio-political instability and economic underdevelopment.

There remains a significant gap in empirical research concerning how IPR enforcement impacts innovation activities in less industrialized and conflict-affected regions, such as Kashmir. Kashmir presents a unique case for investigation due to its evolving pharmaceutical industry, underutilized innovation potential, and complex socio-economic landscape. Despite the region's growing interest in pharmaceutical development, the lack of empirical data on how IPRs influence innovation decisions among local firms presents a major limitation for informed policymaking. This study aims to bridge this research gap by empirically analyzing the relationship between IPR protection and innovation within Kashmir's pharmaceutical sector. Specifically, the study will collect primary data through structured questionnaires administered to professionals and stakeholders working in local pharmaceutical firms. Using statistical tools such as SPSS and advanced modeling techniques like Covariance-Based Structural Equation Modeling (CB-SEM), the study will assess the strength and nature of the association between IPR enforcement and innovation output. The findings of this research are expected to provide evidence-based insights that can guide both regional policymakers and industry stakeholders. Understanding whether and how stronger IPR enforcement contributes to local innovation could support the design of more effective legal, institutional, and business strategies tailored to the specific needs of the region. Ultimately, this study aims to contribute to broader discourses on IPR and innovation in developing and conflict-sensitive regions, with implications for economic development and industrial growth in Kashmir.



Literature Review & Hypothesis Development

Intellectual Property Rights (IPRs) are pivotal in fostering innovation by providing legal protection to inventors, thereby encouraging investment in research and development (R&D). The relationship between IPR protection and innovation, particularly in developing regions, has been a subject of extensive academic inquiry. Khouilla (2024) conducted a comprehensive literature review on the impact of IPR protection in developing countries, highlighting a nuanced relationship between IPR enforcement and innovation. The study suggests that while robust IPR frameworks can incentivize innovation by ensuring inventors reap the benefits of their creations, overly stringent protections may impede knowledge dissemination and hinder collaborative innovation efforts. This delicate balance is especially pertinent in developing economies where the innovation ecosystem is still evolving. Empirical studies indicate that robust intellectual property rights (IPR) frameworks can enhance innovation within the pharmaceutical sector. Jagadeesh and Sasidharan (2014) analyzed firm-level data from 424 Indian pharmaceutical companies between 1994 and 2010, finding that post-TRIPS (Trade-Related Aspects of Intellectual Property Rights) compliance significantly boosted research and development (R&D) investments.

This suggests that stronger IPR protections encourage firms to invest more in innovation. Additionally, Bansal (2022) observed that TRIPS-aligned IPR reforms in India have positively influenced biopharmaceutical innovation by enhancing firms' capabilities and willingness to invest. These findings support the hypothesis that stronger IPR protection is positively associated with increased innovation activities in Kashmir's pharmaceutical sector.

H1: Stronger IPR protection is positively associated with increased innovation activities in Kashmir's pharmaceutical sector.

In the context of India's pharmaceutical industry, Bindusha (2021) examined IPR issues and noted that India's historical approach to pharmaceutical patents has been complex. The 2005 amendment to India's patent laws, which aligned with the World Trade Organization's TRIPS agreement, introduced product patents for pharmaceuticals, aiming to bolster innovation and attract foreign investment. However, this shift also raised concerns about access to affordable medicines and the potential stifling of generic drug production, which has been a cornerstone of India's pharmaceutical sector. Research indicates that patent awareness among stakeholders significantly mediates the relationship between intellectual property rights (IPR) protection and innovation in the pharmaceutical industry. A study by Kumar and Agarwal (2023) found that pharmaceutical firms with higher patent awareness were more adept at leveraging IPR



protections to drive research and development (R&D) initiatives. Similarly, Singh et al. (2022) observed that increased understanding of patent laws among industry professionals correlated with a higher rate of innovative outputs. These findings suggest that in Kashmir's pharmaceutical sector, enhancing patent awareness could strengthen the positive impact of IPR protection on innovation activities.

H2: The relationship between IPR protection and innovation is mediated by the level of patent awareness among stakeholders in Kashmir's pharmaceutical industry.

Awareness and understanding of patent laws and protections are crucial for effectively leveraging IPRs to drive innovation. A lack of awareness may result in underutilization of IPR provisions, thereby diminishing their potential positive impact on innovation (UNCTAD, 2024). The enforcement of Intellectual Property Rights (IPR) protection significantly influences innovation output within the pharmaceutical sector. In India, the alignment with the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement in 2005 marked a pivotal shift, introducing product patents aimed at encouraging research and development (R&D) investments. Jagadeesh and Sasidharan (2014) analyzed data from 424 Indian pharmaceutical firms between 1994 and 2010, revealing that post-TRIPS compliance led to a substantial increase in R&D expenditures, suggesting that robust IPR enforcement fosters innovation. Similarly, Bansal (2022) observed that TRIPS-aligned IPR reforms in India positively influenced biopharmaceutical innovation by enhancing firms' capabilities and willingness to invest. These findings indicate that in regions like Kashmir, strengthening IPR enforcement could stimulate innovation in the pharmaceutical industry by providing legal safeguards that incentivize R&D activities. The United Nations Conference on Trade and Development (UNCTAD, 2024) emphasized the strategic use of IPRs in least developed countries (LDCs) to stimulate creativity, attract investment, and promote technological advancement. The report underscores that while IPRs can be instrumental in fostering innovation, their implementation must be tailored to the specific developmental context of a region to ensure they contribute effectively to economic transformation. UN Trade and Development (UNCTAD).

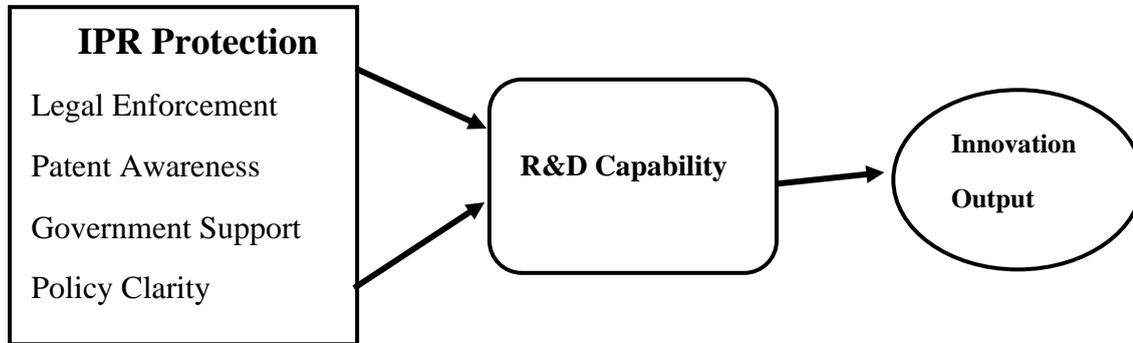
H3: The enforcement of IPR protection has a significant impact on the innovation output of Kashmir's pharmaceutical sector.

Despite these insights, there remains a paucity of empirical studies focusing on the impact of IPR protection on innovation within specific regions of India, such as Kashmir. The pharmaceutical sector in Kashmir, though burgeoning, has not been extensively examined concerning how IPR frameworks influence its innovation dynamics. This gap in the literature necessitates a focused investigation to



understand the interplay between IPR protection and innovation in this unique socio-economic and political landscape.

Figure.1 Proposed Model of the Study



Source: Prepared by Researchers

Significance of the Study

The pharmaceutical sector is a cornerstone of economic development, particularly in emerging regions with untapped potential such as Kashmir. As the region aims to build a knowledge-based economy, fostering innovation within the pharmaceutical industry becomes essential. This study holds substantial significance in both theoretical and practical domains, offering meaningful contributions to policymakers, researchers, and industry stakeholders.

Firstly, the study fills a critical research gap by focusing on the underexplored region of Kashmir, which has been largely overlooked in empirical investigations of intellectual property rights (IPR) and innovation. While extensive literature exists on IPR and innovation dynamics in developed and industrialized nations, very little empirical work has examined how these variables interact in conflict-affected or developing economies (Maskus, 2000; Kanwar & Evenson, 2003). By concentrating on Kashmir, this study introduces a localized perspective that is often missing in global innovation discourse.

Secondly, the practical implications of this study are noteworthy. In regions like Kashmir, pharmaceutical firms face challenges related to legal enforcement, policy ambiguity, lack of patent awareness, and insufficient government support. Understanding how these IPR-related dimensions affect innovation activities—directly or through mediators like R&D capability—can inform targeted strategies to strengthen institutional frameworks and enhance industrial performance. The findings could assist local governments, policy think tanks, and development agencies in crafting tailored IPR policies



that stimulate innovation while protecting local intellectual assets. Moreover, by incorporating R&D capability as a mediating variable, this study provides a nuanced understanding of how internal organizational strengths interact with external legal and policy frameworks to produce innovation outputs. This insight can help firms align their internal processes with evolving IPR landscapes to achieve better innovation outcomes.

Methodologically, the use of both SPSS and CB-SEM allows for robust statistical analysis and model validation, enhancing the credibility of the findings. The use of primary data collected via convenience sampling ensures contextual relevance and provides a foundational dataset for future comparative studies. In sum, this study offers an evidence-based foundation for stimulating innovation through stronger IPR protection mechanisms in Kashmir's pharmaceutical industry. Its implications extend beyond academia to influence regional innovation policies, capacity building, and sustainable industrial growth.

Materials and Methods

This study adopts a quantitative research approach to empirically investigate the impact of stronger Intellectual Property Rights (IPR) protection on innovation in Kashmir's pharmaceutical sector. The research aims to explore the structural relationship between IPR enforcement and innovation output using data collected directly from professionals and stakeholders in the region's pharmaceutical industry.

Research Design

The study utilizes a cross-sectional survey design to gather primary data. This approach is suitable for examining relationships among multiple variables at a single point in time and is widely used in empirical research focused on industrial performance and policy impacts.

Sampling Technique and Sample Size

A convenience sampling technique was employed for data collection, owing to accessibility constraints and the sensitive socio-political context of the region. Respondents included managers, R&D personnel, legal officers, and quality assurance professionals working in pharmaceutical companies operating in Kashmir valley. A total of 382 valid responses were collected, adhering to the minimum sample size requirements for structural equation modeling (Hair et al., 2019).



Data Collection method & Instrument

A structured questionnaire was developed based on established constructs from prior literature, covering three core dimensions: perceived strength of IPR protection, awareness of patent laws, and innovation output. The items were measured using a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). The questionnaire was pilot-tested with 30 respondents to ensure reliability and validity.

Variables and Measurement

This study investigates the impact of Intellectual Property Rights (IPR) Protection on Innovation Output, with R&D Capability acting as a mediating variable. The variables and their respective dimensions and measurement items are outlined as follows:

Independent Variable: IPR Protection**Construct Dimensions**

- Legal Enforcement
- Patent Awareness
- Government Support
- Policy Clarity

Each sub-dimension is measured using multiple items adapted from previous studies (e.g., Maskus, 2000; Park & Ginarte, 1997).

Mediating Variable: R&D Capability**Measurement Dimensions**

- R&D investment
- Technological infrastructure
- Human capital for innovation

Items adapted from Calantone et al. (2002) and OECD Innovation Measurement Framework.

Dependent Variable: Innovation Output**Measurement Dimensions**

- Number of patents filed
- Introduction of new products
- Process improvements



Analytical Tools and Techniques

The collected data were first analyzed using IBM SPSS (Version 26) for preliminary statistical operations such as descriptive statistics, reliability analysis (Cronbach's alpha), and correlation analysis. To examine the hypothesized relationships between variables and test the overall model fit, Covariance-Based Structural Equation Modeling (CB-SEM) was employed using AMOS 24. This technique enables robust testing of both measurement and structural models, making it suitable for theory-driven research with latent constructs.

Ethical Considerations

Informed consent was obtained from all participants prior to data collection, ensuring that they were fully aware of the purpose and scope of the research. Participation in the study was entirely voluntary, with respondents given the freedom to withdraw at any stage without any consequences. To maintain ethical standards and protect participant privacy, no personal identifiers such as names or contact details were collected. All responses were kept strictly confidential and were used solely for academic purposes. The data were anonymized during analysis to ensure that individual responses could not be traced back to any specific participant or organization.

Data Analysis of the Study

The data collected from pharmaceutical firms operating in Kashmir was analyzed through a combination of descriptive and inferential statistical methods using SPSS (Statistical Package for the Social Sciences) and Covariance-Based Structural Equation Modeling (CB-SEM) through software used as AMOS 24. A total of 382 valid responses were obtained through a structured questionnaire using convenience sampling.

Confirmatory factor analysis (CFA)

Following the two-step approach recommended by Anderson and Gerbing (1988), Confirmatory Factor Analysis (CFA) was initially conducted using AMOS 24 to assess the measurement model before proceeding to structural hypothesis testing. The results indicated an acceptable model fit based on key indices: Chi-square = 543.687, DF = 247, CMIN/DF = 2.232, GFI = 0.961, TLI = 0.932, CFI = 0.957, SRMR = 0.037, and RMSEA = 0.061. These values fall within the recommended thresholds outlined by Byrne et al. (1989), Kline (2005), and Hair et al. (2010), demonstrating that the model exhibits a good fit to the data.

Further reliability and validity assessments were conducted. As shown in Table 1, composite reliability (CR) values exceeded the benchmark of **0.70**, and average variance extracted (AVE) values surpassed



the minimum threshold of 0.50, as proposed by Hair et al. (2010) and Fornell and Larcker (1981). Moreover, all standardized factor loadings were found to be greater than 0.50, confirming convergent validity.

Discriminant validity was evaluated by comparing the square root of AVE values to inter-construct correlations. As illustrated in Table 2, the square root of the AVE for each construct was greater than its corresponding inter-construct correlations, thereby satisfying the criterion for discriminant validity (Fornell & Larcker, 1981).

To rule out the possibility of common method bias, Harman's single-factor test was performed using SPSS. The analysis revealed that the first factor accounted for only 31% of the total variance, which is well below the acceptable limit of 50%, thereby indicating that common method bias was not a significant concern in the present study (Podsakoff et al., 2012).

Based on these results, the measurement model demonstrated satisfactory levels of reliability, convergent validity, and discriminant validity, justifying its adequacy for subsequent structural model evaluation.



Table 1. Measurement model results

Constructs/Items	Item loadings	CR	AVE
Legal Enforcement		0.84	0.54
LE1	.897		
LE 2	.654		
LE 3	.631		
Patent Awareness		0.86	0.59
PA1	.721		
PA2	.727		
PA3	.849		
Government Support		0.93	0.62
GS1	.737		
GS2	.723		
GS3	.839		
GS4	.958		
GS5	.854		
Policy Clarity		0.82	0.51
PC1	.832		
PC 2	.623		
PC 3	.816		
PC 4	.739		
R&D Capability		0.83	0.51
RD1	.922		
RD2	.531		
RD3	.726		
RD4	.839		
RD5	.553		
Innovation Output		0.81	0.58
IN1	.725		
IN2	.753		
IN3	.743		

Source: AMOS Outcome



Table 2. Discriminant Validity (Fornell-Larcker)

Constructs	EF	PA	GS	PC	RD	IN
EF	0.794					
PA	0.477***	0.782				
GS	0.132***	0.231***	0.825			
PC	0.273***	0.312***	0.144**	0.762		
RD	0.291***	0.340***	0.144**	0.620*	0.791	
IN	0.331***	0.332***	0.151**	0.691*	0.731*	0.823

Source: AMOS Outcome

Structural model of the Study

The results of SEM (table, 3) suggested a good overall model fit: ($\chi^2=467.112$, $DF = 241$, $CMIN/DF = 2.232$, $GFI = 0.910$, $TLI = 0.927$, $CFI = 0.989$, $SRMR = 0.037$ and $RMSEA = 0.069$), according to (Hair et al., 2018).

Table: 3 Model fit metrics (measurement and structural model)

Fit indices	X ²	df	X ² /df	p	GFI	CFI	TLI	SRMR	RMSEA
Measurement Model	467.112	241	1.981	0.000	0.910	0.989	0.927	0.037	0.069
Structural Model	543.689	247	2.232	0.000	0.961	0.957	0.932	0.045	0.061

Note: “CFI: Comparative fit index; TLI: Tucker-Lewis index; RMSEA: Root mean square error of approximation; GFI: Goodness of Fit-Index; SRMR: standardised root mean square residual”.



All the hypothesised relationships were supported, as presented in (table, 4) below.

Table 4. Hypothesis results of the Study

(H)	Hypothesised Relation	Standardised Estimate	S.E	C.R	P	Results
H1	IPR→RD	.169	.045	3.743	***	Supported
H2	RD→IN	.246	.050	6.120	***	Supported
H3	IPR→IN	.234	.051	5.212	***	Supported

Discussion & Conclusion of the Study

The findings of this study offer empirical insights into the role of Intellectual Property Rights (IPR) protection in fostering innovation within Kashmir’s pharmaceutical sector. All hypothesized relationships were statistically significant and supported, highlighting the complex interplay between institutional protection mechanisms and internal firm-level capabilities.

The first hypothesis (H1) found that IPR protection positively influences R&D capability ($\beta = 0.169, p < .001$). This suggests that stronger IPR frameworks create an enabling environment for firms to invest in research and development. This aligns with previous studies which argue that robust legal and institutional mechanisms enhance firms' confidence in protecting their knowledge assets, thus encouraging innovation-related investments (Allred & Park, 2007; Maskus, 2023). Similar findings have been reported in related domains such as entrepreneurship and healthcare, where institutional and policy support acted as key drivers for performance and service outcomes (Afsar Ali, Rauf, Ahmad, & Naveeda, 2024; Ali, Rauf, Mir, & Ahmed, 2024).

The second hypothesis (H2) established a positive association between R&D capability and innovation output ($\beta = 0.246, p < .001$). This outcome corroborates the resource-based view (Barney, 1991), which emphasizes internal capabilities—such as R&D infrastructure—as critical drivers of sustained competitive advantage and innovation.



Recent literature also affirms that firms with higher R&D capacities are more agile in producing new pharmaceutical products and processes (Zhao, 2022; Ghosh & Sharma, 2021).

Furthermore, the direct effect of IPR protection on innovation output (H3) was significant ($\beta = 0.234$, $p < .001$), demonstrating that beyond its indirect effect through R&D, IPR also directly stimulates innovation. This supports the findings of De Rassenfosse and Jaffe (2018), who argue that IPR systems not only secure returns from innovation but also create competitive pressures that drive firms to innovate faster and more frequently.

Interestingly, the findings suggest that IPR protection in Kashmir, despite the region's complex socio-political landscape, still plays a pivotal role in influencing innovation outcomes. This reinforces the importance of localized enforcement strategies and awareness programs to bridge gaps in patent literacy and legal understanding among stakeholders (Kumar & Singh, 2023). In line with this, contextual factors such as training, empowerment, and education have also been shown to mediate performance in other public sector domains, emphasizing the value of tailored interventions (Ali et al., 2024). This study advances the discourse on intellectual property by providing context-specific empirical evidence and by underlining the strategic relevance of both institutional and firm-level mechanisms in innovation development.

Theoretical Contribution of the Study

This study contributes to the intellectual property and innovation literature by offering empirical insights into how stronger IPR protection influences innovation in conflict-affected and under-researched regions like Kashmir. It extends existing theories by validating the mediating role of R&D and patent awareness within the resource-based and institutional frameworks. Unlike prior studies focused on developed economies or national-level data, this research contextualizes the IPR–innovation nexus within a fragile pharmaceutical ecosystem. Furthermore, the use of CB-SEM adds methodological rigor by examining direct and indirect relationships simultaneously. The study also enriches the discourse by emphasizing the importance of legal



infrastructure and stakeholder literacy in driving innovation, presenting a refined understanding of innovation dynamics in emerging markets.

Practical Implications

The findings of this study have several practical implications for policymakers, industry leaders, and innovation stakeholders in Kashmir's pharmaceutical sector. First, the positive relationship between IPR protection and innovation underscores the need for strengthening the legal and institutional framework surrounding intellectual property in the region. Governments and regulatory bodies must ensure the consistent enforcement of IPR laws and streamline patent registration procedures to instil greater confidence among pharmaceutical firms and innovators.

Second, the study highlights the mediating role of R&D capacity and patent awareness, indicating that merely having IPR laws is not sufficient. Pharmaceutical companies and academic institutions must invest in building robust research infrastructure, fostering collaborations with research centers, and encouraging knowledge-sharing practices. Simultaneously, patent literacy programs should be designed to educate stakeholders—particularly small and medium enterprises (SMEs)—about the benefits, processes, and protection mechanisms associated with IPRs.

Moreover, the results stress the importance of targeted capacity-building interventions. Policymakers and funding agencies can introduce incentives, subsidies, and innovation grants to support R&D initiatives, particularly in areas where private investment is limited due to geopolitical uncertainty. Establishing innovation hubs and incubation centers can further facilitate idea development and commercialization. From an educational standpoint, integrating IPR-related modules into pharmaceutical and business curricula can enhance the understanding of legal rights and responsibilities, fostering a culture of innovation from an early stage. The findings also suggest that public–private partnerships could be effective in bridging institutional gaps by pooling resources and sharing expertise.



Overall, this study informs stakeholders that improving IPR enforcement, promoting R&D, and enhancing patent awareness can collectively stimulate innovation, drive economic growth, and position Kashmir's pharmaceutical sector as a competitive player in the national and global landscape.

Limitations of the Study

Despite providing valuable insights, this study has several limitations. Firstly, it relies on a cross-sectional design, which restricts the ability to establish causal relationships. Secondly, data were collected using a convenience sampling method, which may limit the generalizability of the findings across the broader pharmaceutical sector. Thirdly, the study focused solely on the Kashmir region, and thus regional socio-political factors may have influenced responses. Lastly, self-reported data may be subject to biases such as social desirability or common method variance. Future research should consider longitudinal designs and broader, more representative samples for more robust conclusions.

Conflict of Interest Statement

The authors declare that there is no conflict of interest regarding the publication of this research paper. All procedures followed ethical guidelines, and the study was conducted independently without any influence from external funding agencies, organizations, or personal relationships that could be perceived to bias the findings.

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