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Evaluation of the dynamics of actors in the regulation of drug poisoning

Raúl José Martelo Gómez[1], Piedad Mary Martelo Gómez[2], Carlos Alberto Severiche Sierra[3]

[1]Specialist in Networks and Telecommunications; Master in Computer Science. Systems Engineer. Tenured Research Professor of the Systems Engineering Program at the Universidadde Cartagena. Leader of the INGESINFO Research Group. Cartagena de Indias, Colombia. Email: rmartelog1@unicartagena.edu.co
[2]Odontologist. Independent researcher. Professor of the Dentistry Program at the Universidad de Cartagena, Colombia. Email: pmartelog@hotmail.com.
[3]Tenured Professor at the Universidad de Cartagena, Cartagena de Indias, Colombia. Email: cseveriches@unicartagena.edu.co.

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ABSTRACT
This article explores the power dynamics and strategic relationships among various actors in the regulation of drug poisonings using the MACTOR method. A total of eight actors were analyzed, including government regulatory agencies, healthcare institutions, the pharmaceutical industry, and the media, among others. The findings show that regulatory agencies have a positive influence on all objectives because their role is fully aligned with effective regulation and health system improvement, while healthcare institutions focus on reducing poisonings and strengthening pharmacovigilance. It is also evident that the regulation of drug poisonings requires a collaborative approach that considers the dynamics of influences, commitments, and strategic distances among actors. This study provides a comprehensive view of the system and highlights critical areas for improving the effectiveness of regulatory policies, contributing to safer and more sustainable drug management globally.

Keywords: drug regulation, health, poisoning, pharmacovigilance, pharmaceutical industry, MACTOR.

INTRODUCTION

Drug poisonings constitute a global public health problem due to their impact on morbidity, mortality, and health systems. According to the World Health Organization (WHO), self-medication or misuse of drugs is one of the main reasons why inappropriate drug use is considered the leading cause of poisoning and is reported globally (WHO, 2019). In low- and middle-income countries, where pharmaceutical regulations may be less strict, this situation can be much more serious due to unequal access to health services and limitations in patient education (Emmerick et al., 2013).

The existing literature argues that effective regulation of medicine use requires the active involvement of actors, including governments, healthcare institutions, pharmaceutical companies, and nongovernmental organizations (Dhiman et al., 2019). Previous research has shown that the dynamics of power, influence, and dependency among actors are key to understanding how pharmaceutical regulations are designed, implemented, and controlled (Fierlbeck et al., 2021). However, there is insufficient research that deeply analyzes these relationships, especially in the regulation of drug poisonings.

Despite global efforts to improve regulatory practices for drug use, drug poisonings continue to be one of the most frequent causes of preventable hospitalizations or deaths (Cowans et al., 2023). In many situations, fragmentation among the actors involved and a lack of clarity about their interests hinder the implementation of policies (Schünemann et al., 2022; Vida, 2022). This situation leads to a fundamental question: What are the dynamics of power, influence, and dependency among the actors responsible for regulating poisonings? Making the answer explicit is key to identifying barriers and factors that lead to strengthening regulations and thus reducing their impact.

This research is relevant and necessary because it highlights a gap in the literature on the regulation of drug poisonings, that is, studying them will not only allow for a better approximation of the interactions between the actors involved, but will also contribute to providing information of interest, demonstrating its usefulness in designing better regulatory strategies. As Godet (1991) points out, the analysis of the relationships between actors is a good resource for detecting power imbalances, as well as areas of cooperation that might otherwise go unnoticed.

Consequently, the objective of this paper is to analyze the dynamics of power, influence, and dependency among the actors involved in the regulation of drug poisoning, to uncover their objectives, and to clarify the relationship that determines their interaction. The results of this study will not only represent advances in the production of regulatory knowledge in pharmacology but can also serve as a reference for decision-makers to reduce the occurrence of drug poisoning.

METHODOLOGY

This exploratory-descriptive qualitative study allows for the analysis of the dynamics of power, influence, and dependencies woven between certain relevant actors in the regulation of drug poisoning, which is also a field that has been little analyzed in the regional context. In this sense, Bazen et al. (2021) comment that qualitative studies are ideal for understanding complex interactions and specific contexts, which justifies their selection in this study. Likewise, the exploratory nature allows for mapping actors and initial objectives initially based on reviewed documents (Swedberg, 2020), while the descriptive nature allows for subsequent analysis with the application of the MACTOR technique.

The sample consists of 14 purposively selected experts in drug regulation, poisoning, and public health policies. The group of experts represents health institutions, academic institutions, and nongovernmental organizations. This strategy is consistent with Patton's recommendations (2014) regarding sampling in qualitative research, where sampling is maintained as a process aimed at identifying key informants for the production of rich and relevant data.

The methodology developed is based primarily on two phases. First, a systematic literature review was conducted by consulting databases such as PubMed, Scopus, and Google Scholar, as well as official documents from regulatory agencies. This general analysis allowed for identifying the main actors and objectives related to the regulation of drug poisoning. Document review is considered an appropriate technique for building a general information base that can be used to construct more complex research projects (Bowen, 2009).

Next, the MACTOR (Method, Actors, Objectives, Results, Strength) technique was used to support the analysis of power games, influence, and dependency of each of the identified actors, assuming that this tool is very useful when analyzing inter-organizational relationships and influence games in governance situations (Godet & Durance, 2011). Experts also participated through workshops to validate the identified objectives by integrating their perceptions about the relationships between actors. Once the results of the workshops with experts were tested, the MACTOR software was implemented to interrelate the variables and analyze the data obtained from the experts.

On the other hand, it is worth mentioning some limitations of the study: although purposive sampling guarantees the participation of key informants, it runs the risk of bias and selecting insignificant participants, given that according to Morse (2015) this type of bias is common in qualitative research and must be taken into account when interpreting the results. On the other hand, analogously, the results of the MACTOR technique depend largely on the subjective perceptions of the experts, which could lead to the findings not being able to be generalized. However, despite the limitations, this methodology guarantees a rigorous and structured approach to addressing the complexity of the dynamics between the actors in the regulation of drug poisoning.

RESULTS

In the first phase of the study, the document review identified a set of key actors involved in the regulation of drug poisoning. Table 1, which consists of three columns, shows the identified actors. The first column refers to a code that identifies the actor, the second column refers to the actor's name, and the third column is the description or role of each actor.

Table 1. Actors involved in the regulation of drug poisoning

Code	Actor	Description
A1	Government regulatory agencies	Responsible for designing and overseeing regulations related to the use and distribution of medications.
A2	Healthcare institutions	Responsible for handling poisoning cases and generating epidemiological reports.
A3	Pharmaceutical industry	Medicine producers and distributors are key to implementing good practices.
A4	Nongovernmental organizations (NGOs)	Actors who advocate for consumer protection and responsible policies.
A5	Media	Disseminators of critical information about risks associated with medications.
A6	Patients and patient associations	Represent the needs and concerns of those most affected by poisonings.
A7	Academies and research centers	Institutions that generate scientific knowledge about the

		effects of medications and their regulation.
A8	International entities (WHO, PAHO)	Organizations that issue global guidelines and good practices, influencing local policies.

Source: Authors

Likewise, the objectives related to the actors within the analyzed system were defined. In this context, Table 2 presents the general objectives associated with the management and regulation of drug poisoning. Each objective, like the actors, is represented by a specific code, the objective name, and a description, as shown in Table 2.

Table 2. Objectives identified in the regulation of drug poisoning

Code	Objective	Description
O1	Reducing poisonings	To reduce the incidence of drug poisonings through regulatory strategies.
O2	Strengtheningpharma covigilance	To promote pharmacovigilance systems that prevent drug-related risks.
O3	Creating agile regulatory frameworks	To adapt regulations to technological advances for more effective regulation.
O4	Educational capabilities for patients	To empower patients with knowledge for responsible medication use.
O5	Promoting transparency	To increase transparency in the marketing and distribution of medicines.
O6	Strengthening scientific evidence	To generate research that supports regulatory decisions based on robust data.

Source: Authors

The aforementioned information was entered into the MACTOR software to complete the influence matrices and the matrix of valued positions of the objectives and actors, from which the results presented below were generated.

Influence and dependency of the actors that influence the regulation of drug poisoning

In Figure 1, the plane of influences and dependencies of the actors illustrates the distribution and role of each actor in the system. The upper left quadrant contains the dominant actors, who are characterized by having high influence and low dependency on others; no actors were located in this area according to the analysis. In the upper right quadrant, corresponding to the link actors, there are five actors: A1, A2, A3, A7, and A8, who stand out for their great influence and, at the same time, their high dependency on others. The autonomous actors, located in the lower left quadrant, have low influence and low dependency within the system, and this group includes actors A4, A5, and A6. Finally, in the lower right quadrant, where the dominated actors are located, with low influence and high dependency, no classification is presented.

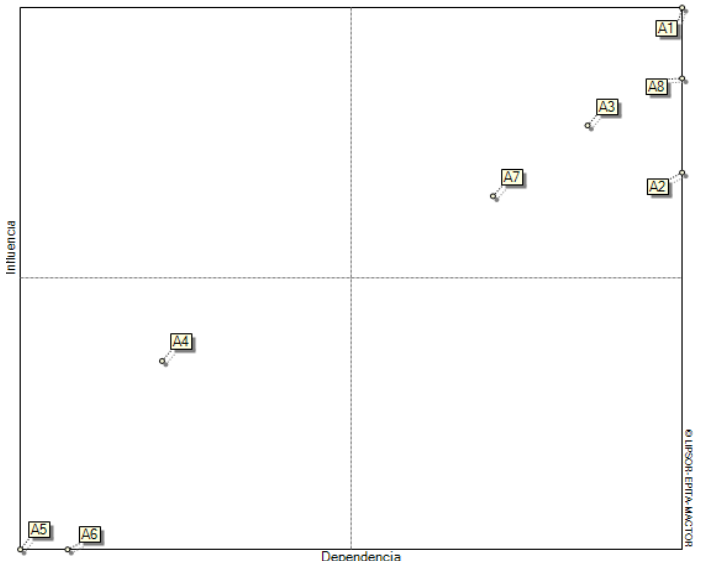

Figure 1. Plane of positions of influence and dependency of the actors in the regulation of drug poisoning

Source: Authors

Relationships of strength of each of the actors in the regulation of drug poisoning

Once the actors were classified, the power relationships between them were analyzed using the histogram generated by the MACTOR software. As shown in Figure 2, the results indicate that the most powerful actors are A1, A8, and A3, in that order. Actors with intermediate power relations are A7, A2, and A4. Finally, the actors with the least power were A5 and A6.

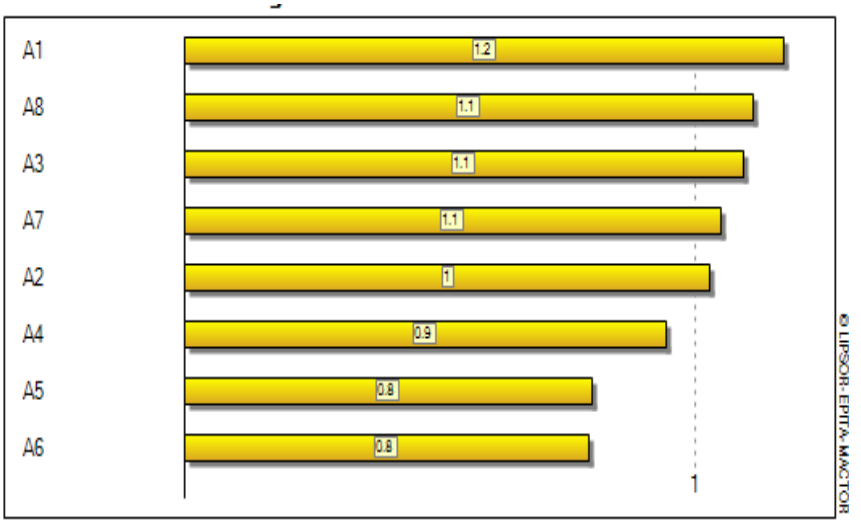

Figure 2. Histogram of the strength relationships of the actors in the regulation of drug poisoning
Source: Authors

Positioning of the actors with respect to the objectives

The results of the actors' position in relation to the objectives are shown below, for which the histogram of actors' involvement in objectives of order 2 (2MAO) is used. Figure 3 presents a histogram showing the actors' levels of commitment to the objectives, while Figure 4 shows a histogram reflecting the actors' capacity to act concerning the objectives of order 3 (3MAO). These results facilitate the identification of the most feasible objectives to achieve according to the degree of actors' commitment to regulating drug poisoning.

In particular, the histogram in Figure 3 indicates a high level of commitment from actors towards objective O1. On the other hand, objectives O2 and O5 show moderate commitment, while objectives O4, O3, and O6 show low levels of commitment from actors.

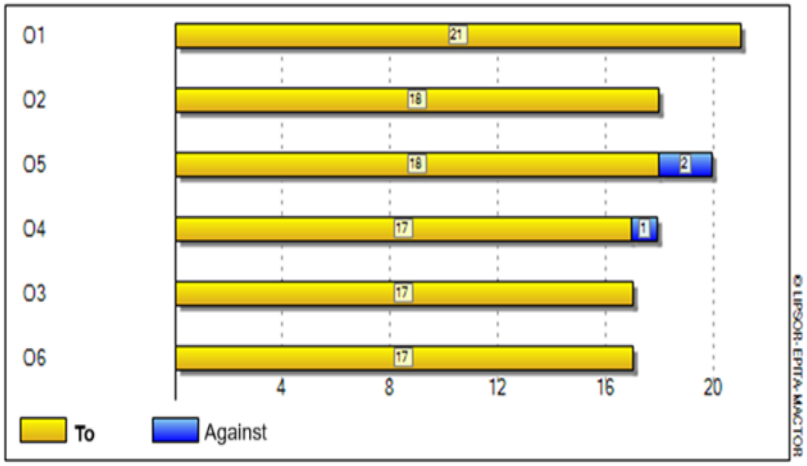

Figure 3. Histogram of actors' involvement in 2MAO objectives
Source: Authors

In contrast, the histogram in Figure 4, which represents the actors' capacity to act in relation to the objectives, shows a high capacity of actors to achieve objectives O1 and O2. Similarly, a moderate capacity is identified for objectives O5, O3, and O6. In contrast, objective O4 shows a limited capacity of actors to act.

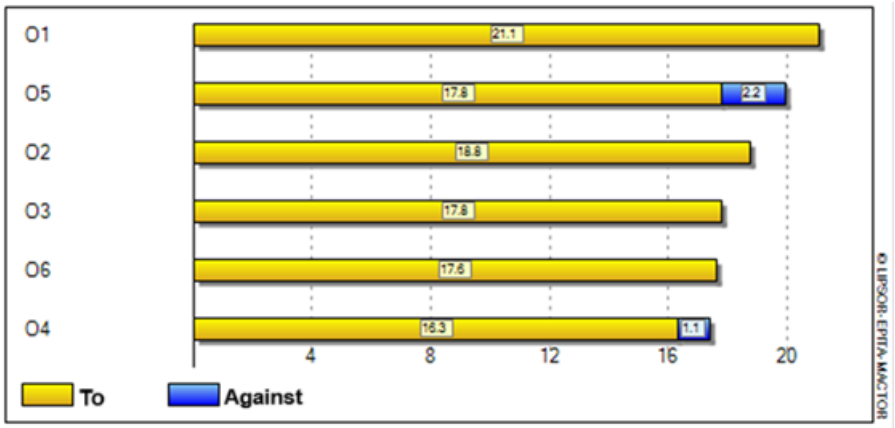

Figure 4. Histogram of actors' involvement in 3MAO objectives
Source: Authors

Convergences and divergences between actors

This analysis facilitates the detection of points of agreement and disagreement among actors. To analyze convergence, a graph of order 2 convergence is used. Figure 5 shows the convergence graph among order 2 actors, indicating that the greatest convergence occurs between actors A1 and A8, which means they are the actors with the most common objectives. It is also observed that the weakest convergence occurs between actor pairs A4-A3, A3-A5, and A3-A6. Furthermore, almost all of them share the same level of individual convergence, with relatively strong and medium convergences. This suggests that the actors have strongly aligned interests, which could facilitate the formation of a solid collaborative group.

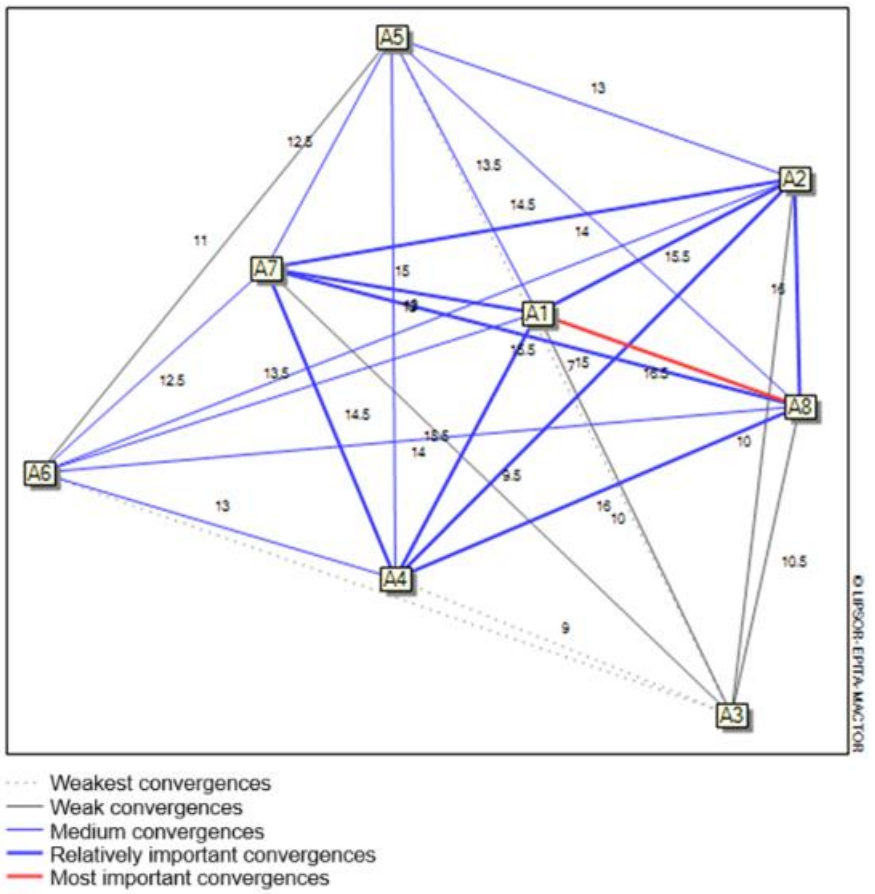

Figure 5. Graph of convergence between actors of order 2
Source: Authors

On the other hand, Figure 6 shows the divergences between the actors. As can be seen, the most important divergences are between actors A4-A3 and A3-A5. Likewise, few medium divergences are observed, and the weakest ones, which reinforces the result that most actors have common objectives.

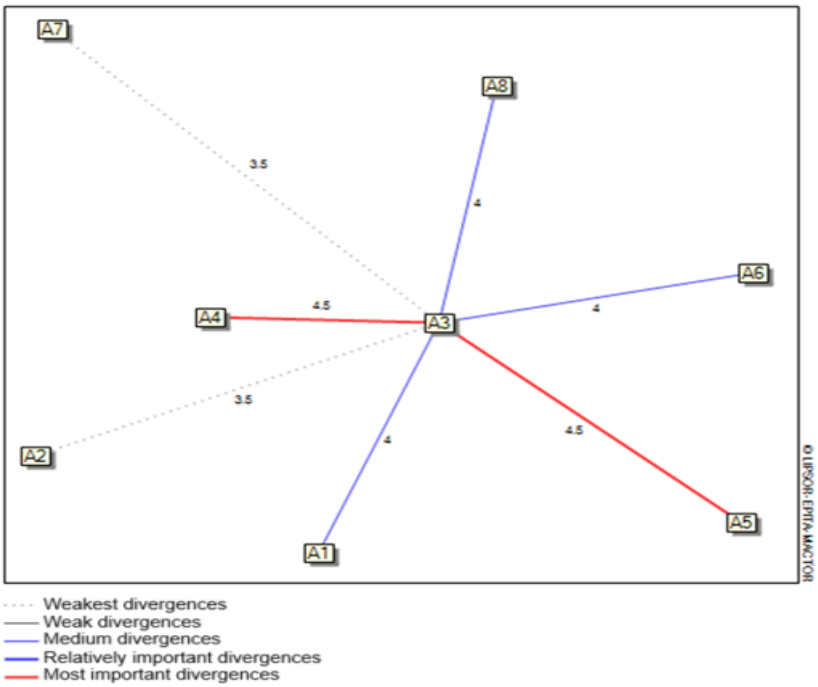

Figure 6. Graph of divergence between actors of order 2
Source: Authors

Based on the results of convergences and divergences, the analysis of possible alliances between actors is carried out using the graph of net distances represented in Figure 7. The net distances between actors are also a measure that reflects the level of strategic convergence or divergence between them in relation to the analyzed objectives. Short distances indicate that actors have a high level of convergence in their objectives, while long distances reflect a significant divergence between the actors' objectives.
The graph shows that the most important (longest) distances are those between actors A8-A1, A8-A2, and A8-A4, all with a value of 16. This implies that their interests are less compatible or in conflict, which can hinder cooperation and increase the probability of tensions.

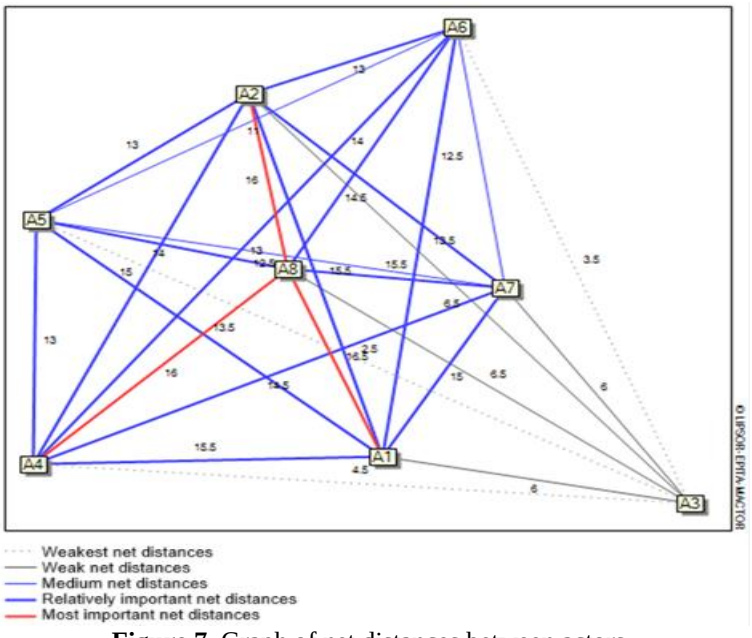

Figure 7. Graph of net distances between actors
Source: Authors

DISCUSSIONS

The results obtained in this study allow for characterizing the dynamics of actors and objectives in the regulation of drug poisoning, identifying patterns of influence, dependencies, commitments, and convergences between key actors.

As observed in the results obtained, actor A1 (Regulatory Agencies) has a positive influence on all objectives because its role is fully aligned with effective regulation and the improvement of the healthcare system. Actor A2 (Healthcare Institutions), on the other hand, focuses on reducing poisonings (O1) and strengthening pharmacovigilance (O2) as priorities, while its relationship with other objectives, although positive, is not as strong. Actor A3 (Pharmaceutical Industry) supports agile regulatory frameworks (O3) and scientific evidence (O6), but could oppose objectives such as patient education (O4) and transparency (O5), since these could affect its commercial interests. Actor A4 (NGOs) has a completely favorable position towards reducing poisonings (O1), transparency (O5), and patient education (O4).

On the other hand, A5 (Media) has as its primary role to inform and educate, so they especially favor O4 and O5. However, they have a less direct relationship with regulatory objectives such as O3 and O2. A6 (Patients and patient associations) strongly favor education (O4) and poisoning reduction (O1), while other objectives, such as regulatory frameworks (O3), are less affected. A7 (Academies and research centers) prioritizes the generation of scientific evidence (O6) and pharmacovigilance (O2), and they do not oppose any objective. The global and positive guiding role of A8 (International entities (WHO, PAHO)) means they support all objectives, especially pharmacovigilance (O2) and regulatory frameworks (O3).

The classification of actors according to influence and dependency reveals that the link actors (A1, A2, A3, A7, and A8) play a central role in the system, combining high influence with high dependency. This finding is consistent with previous studies highlighting the importance of regulatory agencies, health institutions, and international organizations as fundamental pillars for ensuring the safe use of medicines in different contexts (WHO, 2021). In contrast, the absence of dominant actors could reflect a lack of centralized leadership, which can hinder the effective implementation of regulatory policies, as observed in decentralized pharmaceutical regulatory systems.

On the other hand, the location of actors such as NGOs, media, and patients in the autonomous actors quadrant suggests less systemic interaction. This could be related to their more specific and less structural role in regulation, as noted by Vergès et al. (2021), who find that NGOs and patients frequently focus on awareness-raising actions rather than direct regulatory activities.

The analysis of power relations shows that the most influential actors are government regulatory agencies (A1), international entities (A8), and the pharmaceutical industry (A3). These actors are often described in the literature as primarily responsible for designing, implementing, and complying with regulatory standards (Kontoghiorghes, 2021). However, the intermediate position of academic (A7) and healthcare (A2) institutions reflects their supporting role in the system, providing scientific evidence and clinical care, respectively.

The priority objective for actors is the reduction of drug poisonings (O1), suggesting a general consensus on the need to address the main problem. This finding is consistent with the recommendations of the World Health Organization (WHO, 2021), which prioritizes the reduction of drug-related risks as a global strategic focus. On the other hand, low levels of commitment to objectives such as "Patient education capacities" (O4) could reflect the lack of integration of educational strategies into regulatory policies. This aligns with studies that point to limited investment in health education to prevent poisonings (Mottla et al., 2023).

The significant convergences between actors such as A1 and A8, and their alignment with strategic objectives, underscore the opportunity to strengthen alliances between regulatory agencies and international organizations. However, the divergences between actors such as A4 and A3 can represent significant barriers, possibly related to differences in approaches to consumer protection and business practices.

This pattern of convergences and divergences is consistent with the literature that identifies the need for a balance between the interests of the pharmaceutical industry and consumer rights, to achieve equitable and effective regulatory systems (WHO, 2022).

The longer net distances between key actors such as A8 (international entities) and A1 (government regulatory agencies) highlight the lack of alignment on certain strategic objectives. This may reflect tensions associated with the adaptability of local regulations to global guidelines, a problem frequently mentioned in the literature on international cooperation in pharmacovigilance (Peters et al., 2021).

Finally, based on the findings, it is proposed to strengthen partnerships between regulatory agencies and international entities to improve coordination and effectiveness in policy implementation; to integrate educational strategies that empower patients in the responsible use of medications; to incorporate NGOs, the media, and patient associations into consultative and policy co-creation processes, leveraging their role as awareness-raising agents; and to promote scientific research to support regulatory decisions based on solid evidence.

CONCLUSION

Based on the results, the following conclusions can be drawn: government regulatory agencies (A1), health institutions (A2), the pharmaceutical industry (A3), academia and research centers (A7), and international entities (A8) play a critical role in leading collaborative actions in the regulation of drug poisoning. Regulatory agencies (A1) and international entities (A8) show the greatest influence within the system, which underlines the need to strengthen cooperation between these actors, especially for the implementation of coherent regulatory policies at the global and local levels.

Although consensus was identified on the priority of reducing drug poisonings (O1), objectives related to patient education (O4) show a low level of commitment and capacity for action. This gap reflects a critical need to integrate educational strategies that promote responsible medication use, aligning with WHO recommendations. Actors such as NGOs (A4), the media (A5), and patient associations (A6) play important roles in consumer awareness and advocacy, but their direct involvement in regulatory activities is limited. Strategic distances between key actors, such as A8-A1 and A8-A2, highlight the lack of alignment on certain objectives, which hinders effective cooperation.

It is recommended to promote formal alliances between highly influential actors, especially between government agencies, international entities, and academia, to reduce regulatory barriers. Similarly, academia and research centers (A7) are key players in the generation of scientific evidence (O6), reinforcing their importance in supporting regulatory decisions with robust data. In conclusion, the regulation of drug poisoning requires effective governance that prioritizes collaboration between key actors, aligning strategic objectives and reducing strategic gaps. This study contributes to identifying critical areas for optimizing the regulatory system, ensuring safer and more sustainable management of medicines globally.

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