



A Scoping Review of Safeguarding Healthcare Supply Chains: Corruption in the Procurement of Essential Medicines and Equipment during Emergencies

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Abstract

Introduction: This study aimed to critically examine the vulnerabilities of healthcare systems to corruption and to analyze corrupt practices in the procurement of pharmaceuticals and medical supplies during crises, with a particular focus on the COVID-19 pandemic.

Methods: This comprehensive scoping review was conducted in 2024 following the methodological framework proposed by Arksey and O'Malley. The literature search encompassed four major electronic databases, supplemented by manual searches of relevant reports, conference proceedings, and gray literature. A two-reviewer screening process was implemented to determine eligibility based on predefined inclusion and exclusion criteria. Data extraction was performed using a standardized form, and results were synthesized in tabular format to facilitate the identification of key concepts, types of evidence, and research gaps concerning corruption in the procurement of essential medicines and equipment during emergencies.

Results: From an initial yield of 4,294 articles, duplicates and irrelevant studies were removed, resulting in 34 articles eligible for full analysis. The review identified twelve predominant types of corruption that were particularly significant during the pandemic.

Conclusion: This scoping review highlights twelve broad categories of corruption that emerged as critical issues during the COVID-19 pandemic. Key forms of corruption included hoarding, falsification, theft, creation of fictitious bidders, procurement above the market price, document forgery, invoice falsification, failure to deliver goods, bribery, misappropriation, money laundering, abuse of power or position, nepotism, and favoritism. These findings provide valuable insights for healthcare managers and policymakers, facilitating the development of targeted strategies to prevent corruption and promote administrative integrity within medical supply chains, particularly in crisis contexts.

Keywords: Healthcare, Supply Chain, Corruption, Medicine, Equipment, COVID-19

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Introduction

As the COVID-19 pandemic was declared an emergency (1), the demand for medical equipment and pharmaceuticals surged. The rapid spread of the disease intensified pressure on healthcare systems, leading to widespread shortages of essential resources (2). Many governments encountered significant challenges in maintaining the production and distribution of medical products (3). Consequently, public procurement processes became increasingly susceptible to various forms of corruption. Public procurement is defined as the process by which public authorities, such as government departments or local administrations, acquire works, goods, or services (4). The inherent complexity of

procurement procedures, combined with the involvement of substantial financial resources, created opportunities for diverse corrupt practices, which are often exacerbated in emergency contexts such as the COVID-19 pandemic (5). In such situations, principles of competition, integrity, and transparency may be temporarily compromised, while monitoring mechanisms may weaken, allowing corruption to remain concealed (6).

Within the healthcare sector, the pharmaceutical industry is particularly vulnerable to corruption (7). Corrupt practices in drug procurement erode public trust in government institutions and undermine efforts to achieve health-related objectives (8). Healthcare systems,



in general, are especially susceptible during emergencies, creating fertile ground for corrupt practices (5). In this context, corruption—defined as the abuse of delegated authority for private gain—manifests in various forms, including the production and distribution of substandard medications, resource diversion and wastage, and non-transparent governance processes (9). During health crises, corruption disproportionately affects marginalized populations by severely restricting equitable access to essential items, including medical supplies and pharmaceuticals, particularly when quality standards are compromised (9, 10). The COVID-19 pandemic exemplified these vulnerabilities, as corruption disrupted routine healthcare operations. Operational interruptions, supply-demand imbalances, and pervasive uncertainty collectively facilitated the exploitative behaviors of corrupt actors (10).

According to Kohler's cross-national study, corruption has emerged as a critical challenge within the healthcare systems of developing countries. This systematic analysis identified seven prevalent mechanisms of corruption: (a) embezzlement of medical funds, (b) weak regulatory oversight, (c) absenteeism among health workers, (d) fraudulent billing practices, (e) theft of medical supplies, (f) informal under-the-table payments, and (g) opaque procurement procedures (11). Similarly, Buseh et al. conducted an empirical investigation of pharmaceutical supply challenges during the Ebola outbreak and documented three distinct manifestations of corruption: (a) falsification of procurement documentation, (b) inflated pricing of personal protective equipment, and (c) diversion of scarce resources to black markets (12). The COVID-19 pandemic has further exacerbated vulnerabilities in the drug supply chain, creating numerous operational and ethical challenges. In response to these risks, many countries have implemented diverse strategies aimed at securing essential medicines and medical equipment. Given that shortages of drugs and equipment pose a significant threat to patient care, it is crucial to ensure systematic coordination, prioritize needs, and implement effective strategies to manage supply chain disruptions during emergencies (13, 14).

The COVID-19 pandemic highlighted the strong interconnection between corruption and public health crises. To ensure adherence to public health standards and the timely procurement of essential products, governments can strengthen procurement processes and reduce the time required to acquire critical equipment (15). However, relaxing regulatory requirements without adequate enforcement mechanisms may exacerbate the risk of corruption (16). In this context, obtaining reliable data on the extent to which corruption affects public health responses during crises remains challenging. Nonetheless, inefficiencies arising from corrupt practices at various stages—from planning to implementation—undermine the capacity of healthcare delivery systems to safeguard public health. Evidence indicates that corruption not only diminishes the value of public investments but also

compromises the effectiveness of health programs (17).

Corruption posed significant obstacles to the procurement of pharmaceuticals and medical equipment during the COVID-19 pandemic. The inherent vulnerabilities of healthcare systems, combined with the urgency of the crisis, created a high-risk environment for corrupt practices. Specifically, corruption in public procurement facilitated the overpricing of essential medical supplies and pharmaceuticals, leading to adverse public health outcomes. These challenges underscore the urgent need for strategies aimed at mitigating corruption in healthcare supply chains, particularly during public health emergencies. This study sought to inform anti-corruption efforts by critically examining vulnerabilities within healthcare systems and analyzing the various forms of corruption that emerge in the procurement of pharmaceuticals and medical supplies during crises.

Methods

A scoping study is a type of research review designed to rapidly map the key concepts, sources, and types of evidence within a specific research area. It is particularly useful when a field is complex or has not been comprehensively reviewed previously. The primary objectives of a scoping study include examining the extent, range, and nature of research activities in a given domain, evaluating the feasibility and value of conducting a full systematic review, summarizing and disseminating research findings, and identifying gaps in the existing literature. Conducting a scoping study offers several advantages: it provides a concise yet comprehensive summary of fundamental concepts, enables a thorough assessment of the scope and nature of research activities, and allows the extrapolation of findings to broader contexts. Unlike a systematic review, a scoping study does not critically appraise the quality of the included research; instead, it focuses on offering a broad overview of the available evidence and mapping key concepts. As such, scoping studies serve as valuable tools for summarizing existing research and highlighting areas where further investigation is needed.

Due to the critical importance of the topic, a scoping review was conducted to identify the various types of corruption in the procurement of essential medicines and equipment during emergencies. This review was guided by the methodological framework proposed by Arksey and O'Malley (18), and was conducted in several major steps as described below.

Identifying the Research Question

As is standard practice in review studies, the initial step in a scoping review involves clearly defining the research question, which subsequently guides the development of the search strategy. The research question for this study was: "What is known from the existing literature about corruption in the procurement of essential medicines and equipment during emergencies?" The concept of corruption in the provision of pharmaceuticals and medical equipment is multifaceted, potentially resulting in adverse outcomes

for healthcare organizations and manifesting in various forms.

Identifying Relevant Studies

To achieve the objectives of this study, a comprehensive search strategy was employed, incorporating multiple sources of evidence, including academic databases, manual literature searches, relevant reports, and conference proceedings. Given time constraints, only studies published between 2019 and 2024 were considered, with 2019 marking the onset of the COVID-19 pandemic. Besides, due to translation costs, only English-language studies and reports were included.

The search strategy (Annex 1) was developed and refined by reviewing existing literature on corruption in the procurement of essential medicines and equipment, ensuring appropriate identification and cross-checking of keywords, MeSH terms, and databases. Both peer-reviewed and gray literature were searched using keywords, synonyms, and their variations, including:

- **Concept 1:** “corruption” OR “falsification” OR “kickbacks” OR “embezzlement” OR “misuse” OR “fraud” OR “theft”
- **Concept 2:** “emergency procurement” OR “purchasing” OR “procurement processes” OR “purchasing goods” OR “purchasing services” OR “procurement”
- **Concept 3:** “pharmaceutical products” OR “products pharmaceutical” OR “drug*” OR “pharmaceutical” OR “pharmaceutic*” OR “pharmacological” OR “medicine*” OR “medication” OR “medicament”
- **Concept 4:** “medical equipment” OR “medical supplies” OR “device*” OR “supplies and equipment”

OR “apparatus and instruments” OR “instruments and apparatus” OR “medical devices” OR “device medical” OR “equipment”

Reference lists of the selected studies were reviewed, and snowballing techniques were applied to identify additional relevant studies. Moreover, relevant guidance documents from the World Health Organization (WHO) were reviewed and incorporated into the study.

Note: The syntax of search terms was adapted for each database according to its indexing and search capabilities.

Selecting appropriate studies

To identify relevant articles, the researchers focused on English-language publications reporting on corruption in the procurement of essential medicines and equipment during emergencies. A two-reviewer process was employed to apply predefined inclusion and exclusion criteria to all retrieved citations. Studies considered the ‘best fit’ with the research question—including reports, as well as qualitative and quantitative articles—were selected for further review. Screening was conducted in three stages: title, abstract, and full-text review. Non-relevant articles were excluded at each stage. Following initial collection, duplicates were removed, and the remaining articles were screened independently by two researchers based on titles and abstracts. Articles failing to meet the inclusion criteria were excluded. When the relevance of an article was unclear from the abstract, the full text was examined. In the final stage, the reviewers assessed the full-text articles to determine their eligibility for inclusion in the review. Any disagreements between reviewers were resolved through discussion or, when necessary, consultation with a third reviewer. Data extraction was then conducted on the included studies. The researchers utilized EndNote X5

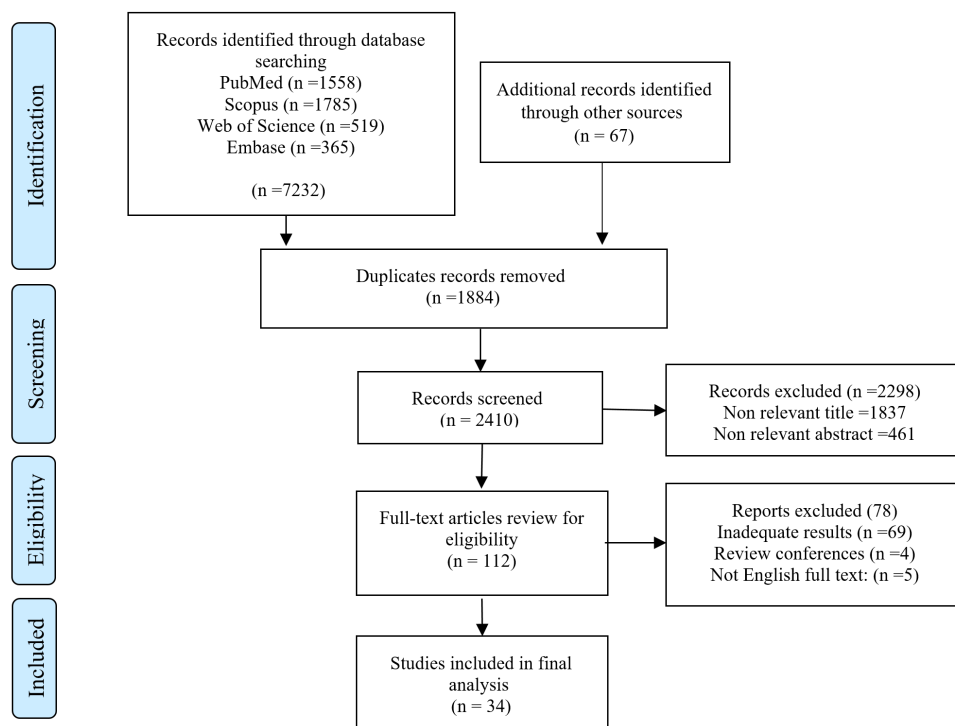


Figure 1. PRISMA flow chart of the studies

software to organize the articles, review titles and abstracts, and identify duplicates. The selection and screening process was systematically documented using the PRISMA flowchart to ensure transparency and reproducibility of the review process (Figure 1).

Inclusion/exclusion criteria

This scoping study was conducted according to predefined inclusion and exclusion criteria. The primary inclusion criterion was the originality of studies addressing the COVID-19 pandemic and corruption in the procurement or supply of medicines and medical equipment. Exclusion criteria included studies reporting corruption unrelated to pharmaceuticals or medical equipment, review articles, letters to the editor, and publications in languages other than English.

Tabulating the data

The research team developed a standardized data extraction form to systematically organize and tabulate relevant information. Data were extracted using this carefully designed form within Microsoft Excel 2016. The extraction process was conducted independently by two researchers with extensive expertise in the field. In cases of disagreement, a third reviewer facilitated discussions to reach a consensus. Extracted data were compiled into a comprehensive data extraction table and included details such as the author's name, year of publication, study objective, and the identified type of corruption.

Summarizing and reporting

This stage of the scoping review focused on the systematic collation, concise summarization, and comprehensive reporting of the results. A scoping study generally provides an overview of a broad body of literature rather than critically appraising the quality of individual studies or assessing their generalizability. To achieve this, an analytical framework or thematic structure is typically employed, allowing for the synthesis of findings into a coherent narrative that integrates existing reports. In the present study, data were independently coded by two researchers. The data analysis and coding process involved several steps: (a) familiarization with the full-text articles, (b) identification and extraction of primary themes, (c) classification of articles under the designated themes, (d) review of each study's findings, and (e) verification of the reliability of the materials and extracted results within each thematic area. The findings obtained through this procedure are presented in Table 1. Accordingly, the literature was organized thematically to systematically capture the diverse types of corruption identified in the procurement of essential medicines and medical equipment during emergencies.

Results

A total of 4,294 articles and reports were initially retrieved from various databases and sources. Of these, 1,884 duplicate records were removed, and a further 2,298 articles and reports were excluded during the title and abstract

screening phase. During the full-text review, an additional 78 articles and reports were excluded. Ultimately, 34 studies specifically addressing the procurement of essential medicines and medical equipment during the COVID-19 pandemic were included for analysis (Figure 1). The included studies were thoroughly reviewed, and relevant data were extracted using the predesigned data extraction form. Table 1 summarizes the types of corruption identified during the COVID-19 pandemic.

Corruption in the healthcare sector can be broadly classified into six general categories:

1. Bribery in the delivery of medical services
2. Corruption in the procurement of medicines and medical equipment
3. Inappropriate marketing practices
4. Abuse of one's position or authority
5. Undue reimbursement claims
6. Fraud and embezzlement related to medicines and medical devices

To illustrate the prevalence and diversity of these corrupt practices, a word cloud was created (Figure 2) to depict the relative frequency of each corruption type identified in the reviewed literature. This visual representation highlights the multifaceted nature of corruption in healthcare systems during the COVID-19 pandemic, encompassing both operational-level malfeasance and higher-level misuse of power and authority.

As illustrated in the word cloud, the most frequently reported forms of corruption included nepotism and favoritism in management, misappropriation of healthcare budgets, procurement above the market price, non-competitive or discretionary bidding, and the delivery of expired or substandard products. Other prevalent issues encompassed the falsification of drug and medical equipment information, circumvention of proper bidding procedures, bribery-influenced bids, fraudulent activities, and abuse of power or position. These findings underscore the multifaceted and systemic nature of corruption within

Table 1. The most important types of corruption during the COVID-19 pandemic

Number	Examples of severe corruption
1	Hoarding/sale in the open market
2	Falsification of drug and medical equipment information/ delivery of expired or substandard products
3	Theft of medicines and medical equipment
4	Avoidance of proper bidding processes/ fictitious bidders/ ignored bids/ bids affected by bribery/ non-competitive and discretionary bids
5	Procurement above the market price
6	Recruitment without meeting the requirements
7	Fraud/ fake documents/ fake invoices/ undelivered goods/ fake product type and quantity
8	Procurement of substandard or ineffective products
9	Bribery of government officials
10	Misappropriation of the health budget
11	Money laundering
12	Abuse of power or position, nepotism, and favoritism

healthcare procurement and management during the COVID-19 pandemic.

This qualitative analysis not only identified various forms of corruption but also uncovered significant contextual patterns influencing its occurrence. The findings demonstrate that emergency conditions create an environment conducive to corruption by generating time pressures and weakening formal oversight mechanisms. Furthermore, the study reveals how informal networks and power dynamics play a pivotal role in shaping corruption mechanisms. Notably, the lack of transparency in emergency procurement processes emerged as a primary enabling factor across most documented cases of corruption. This study identified the types of corruption that occurred in the procurement of medicines and medical equipment during the COVID-19 pandemic. The findings revealed twelve types of corruption that undermined the efficiency, equity, and integrity of healthcare systems, particularly during the critical phases of the pandemic. This scoping review provides important insights for the development of targeted anti-corruption strategies and strengthened governance mechanisms within the healthcare sector.

One of the most concerning issues identified was the hoarding and sale of medical supplies, including personal protective equipment (PPE) and certain medicines, in the open market. Studies from Norway and the United States demonstrated instances in which healthcare providers exploited their access and authority to write prescriptions for themselves and family members, hoarding potentially effective COVID-19 treatments instead of ensuring equitable distribution to patients (19). Similarly, the diversion of scarce PPE supplies to unregulated markets—often sold at high prices—deprived frontline medical teams of essential protective equipment. Such hoarding and profit-driven behaviors compromised healthcare delivery and restricted access to vital resources.

Another significant issue was the falsification of product information and the delivery of expired or substandard

A review of procurement practices during the COVID-19 pandemic revealed numerous instances in which governments paid significantly inflated prices for medical equipment and supplies. For example, the Colombian government reportedly paid twice the market price for food boxes distributed to families affected by COVID-19 quarantine measures (30). In Mexico, medical equipment was procured at double the price of comparable ventilators (31). Similarly, in several Latin American countries, including Mexico, Colombia, Peru, and Uruguay, N95 masks were purchased at roughly twice their market cost (27). In Brazil, masks were acquired at prices 67% higher than those offered by other suppliers (32). In Poland, a scandal involving the purchase of masks at nearly ten times

the market price led to the resignation of the health minister (33). Bolivia's health minister was arrested for allegedly purchasing ventilators at four times the standard price (16, 34). In Kenya, tenders for medical equipment were frequently awarded to politically connected individuals and businesses (35). The Brazilian government also purchased unapproved Covaxin vaccines at inflated prices through intermediaries (36), while in Bangladesh, the government paid \$100 per vaccine dose despite an approved price of \$10 per dose (37). These cases underscore a pervasive disregard for prudent spending and accountability, suggesting that political influence and cronyism significantly shaped procurement decisions during the pandemic, often at the expense of equitable and efficient access to essential medical resources.

Recruitment without meeting the requirements

A report from Colombia highlighted significant staffing issues during the COVID-19 pandemic, noting that 85% of personnel involved in emergency response were directly recruited, bypassing standard recruitment procedures (38). Such practices reflect a lack of transparency and accountability in certain hiring processes. Maintaining rigorous standards in the employment of healthcare personnel is essential to ensure the efficiency and responsiveness of health systems during public health emergencies.

Fraud/fake documents/fake invoices/undelivered goods/fake product type and quantity

The study identified multiple instances of fraud and document forgery affecting the procurement and distribution of medical equipment and services. In the Netherlands and Germany, a Dutch company reported that it had not received €1.5 million for masks, which were subsequently found to have been misappropriated by fraudulent actors (27). These cases illustrate fraud involving undelivered goods and deceit by illegitimate suppliers. In Bangladesh, incidents were reported involving the sale of counterfeit medical certificates and falsified negative COVID-19 test results (32). Such document fraud not only undermines the integrity of healthcare systems but also facilitates the spread of the virus, compromising public health efforts. Similarly, in France, organized groups were implicated in selling fake certificates and embezzling pandemic relief funds (33). These criminal activities disrupted the delivery of essential resources and services to the populations that needed them most.

Procurement of Substandard or Ineffective Products

The study identified multiple cases in which governments procured medical supplies and equipment that failed to meet quality standards. In the United Kingdom, the government ordered 50 million masks from a company that did not meet specification requirements, indicating a lack of proper review and quality control in the procurement process (27). Similarly, approximately 3.5 million COVID-19 test kits purchased by the UK government

were later found to be ineffective, resulting in significant resource wastage and undermining the ability to accurately monitor viral spread (32).

In Bangladesh, contractors engaged in corruption by supplying regular masks while representing them as high-quality N95 masks (32). In the Russian Federation, fake COVID-19 test kits and PPE were sold at inflated prices, further compromising access to essential protective equipment (39). These examples highlight how corruption in procurement not only wastes resources but also endangers the safety of frontline workers and the public, exacerbating the challenges of pandemic response.

Bribery of government officials

The COVID-19 pandemic created significant opportunities for bribery and corruption in the procurement and distribution of medical equipment and services (40). In Indonesia, the Minister of Social Affairs was implicated in accepting bribes related to a social assistance program, including payments from contractors delivering food packages to vulnerable populations during the pandemic-induced economic downturn (16). Data from Indonesia Corruption Watch (ICW) indicated that bribes totaling 23.43 billion rupees were paid between 2020 and 2021 (40). In Vietnam, Viet A reportedly paid \$35 million as a "reward" to hospital staff to secure a bid for expensive COVID-19 test kits, resulting in substantial profit for the company (41). Similarly, in Brazil, the former head of procurement in the Ministry of Health demanded bribes for each vaccine dose purchased (42). These cases demonstrate serious abuses of power, illustrating how government officials and healthcare professionals exploited their positions for personal gain, undermining the integrity and efficiency of healthcare systems during the pandemic.

Misappropriation of the health budget

The findings of this study revealed widespread embezzlement and misuse of COVID-19-related funds across multiple countries. In Indonesia, the ICW documented 30 cases of corruption involving COVID-19 mitigation funds, including budgets allocated for basic food aid, cash social assistance, and direct cash transfers (40). In China, some local health departments received COVID-19 medical equipment but allocated it unfairly, requiring hospitals to bribe officials to access essential supplies (39). In Kenya, the Ethics and Anti-Corruption Commission reported numerous instances of procedural neglect and misuse of donated funds for medical equipment, with tenders awarded to politically connected individuals and businesses (16). In Saudi Arabia, two senior health officials and a hotel owner were accused of exploiting government funds by charging inflated fees (43). In Vietnam, officials from multiple ministries were implicated in corruption scandals, mismanagement of the COVID-19 budget, overcharging for return flights, and pocketing nearly \$240 million (41). Other notable cases included the arrest of Kyrgyzstan's Minister of Health for wasting \$18.8 million on unnecessary COVID-19 vaccine

doses (15) and the temporary detention of the Democratic Republic of the Congo's Minister of Health for allegedly embezzling \$7 million (44). Additional reports indicated substantial misappropriation or unaudited funds in Afghanistan (\$27,000), the Democratic Republic of the Congo (\$357 million), and Cameroon (\$333 million) (37, 45–47). Collectively, these cases highlight the pervasive and systematic nature of fund mismanagement and corruption during the pandemic across diverse countries and sectors.

Money laundering

In Zimbabwe, government transactions raised serious concerns regarding potential money laundering. The government reportedly paid approximately \$2 million to a newly established company only two weeks after its incorporation, prompting an Interpol investigation into possible illicit activities (29). Subsequently, the company opened a new office in Dubai and requested an additional \$1 million from the Zimbabwean government. These transactions exhibit behavioral patterns consistent with money laundering schemes, highlighting how pandemic-related funds can be exploited for financial crimes.

Abuse of power or position, nepotism, and favoritism

Numerous examples illustrate a disturbing pattern of abuse of power, authority, nepotism, and favoritism during the COVID-19 pandemic across multiple countries. In Argentina, the government awarded a contract to a hotel owned by the mayor's half-sister. In Mexico, medical devices and equipment were procured from a company owned by the son of a state senator. In the United Kingdom, the government directly awarded a contract to a company closely linked to a government adviser and a cabinet minister (27). In Zimbabwe, a company associated with the president's son received a \$1-million contract for COVID-19 equipment (44). In Slovenia, several ministers faced allegations of corruption in the procurement of PPE during the pandemic (32), while in the UK, a senior NHS procurement official was implicated in similar misconduct (20). Failure to address abuse of power, nepotism, and favoritism erodes public trust and undermines effective crisis management.

Leveraging evidence from these cases can assist managers and policymakers in adopting evidence-based practices in future crises, thereby ensuring the continuity and quality of healthcare services (48, 49).

Limitations

At the same time, the study is not without limitations. Data accessibility was restricted to four major databases—Web of Science, PubMed, Scopus, and Embase—which may have limited the breadth of included evidence. Although a comprehensive set of specialized keywords was employed, it remains possible that some relevant studies were not identified or incorporated into the review. These constraints should be considered when interpreting the findings and their generalizability.

Conclusion

This scoping review identified twelve distinct forms of corruption that posed significant challenges to healthcare systems during the COVID-19 pandemic, ranging from the misappropriation of medical supplies and funds to abuses within emergency procurement processes. These findings provide valuable insights for healthcare managers and policymakers seeking to prevent or mitigate corruption, particularly in times of crisis. By recognizing the diverse manifestations of corrupt behavior in the procurement of pharmaceuticals, medical equipment, and other essential resources, stakeholders can strengthen oversight mechanisms, enhance transparency, and implement safeguards that protect the integrity of healthcare systems.

Effectively identifying and addressing corruption remains essential for ensuring the equitable distribution of critical medical supplies, safeguarding public health, and upholding principles of good governance. This review represents an important step toward these goals by equipping decision-makers with foundational knowledge to better protect healthcare systems from corruption, even under extraordinary circumstances. Future research should further explore the prevalence, causes, and consequences of each corruption type, assess the effectiveness of anti-corruption strategies, and examine how technological innovations and improved data transparency may contribute to mitigating corrupt practices.

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Competing Interests

There are no competing interests to declare.

Ethical Approval

This study was approved by the ethics committee of Kerman University of Medical Sciences (Ethical code: IR.KMU.REC.1402.033)

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