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NUCLEAR ARMS CONTROL AND DISARMAMENT IN PERIL: CURRENT STATUS AND LOOMING CHALLENGES

Original Article

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ABSTRACT

Background: Since the end of the Cold War, nuclear arms control has undergone profound challenges due to weakening treaties and rapid military innovations. The expiration of the Intermediate-Range Nuclear Forces (INF) Treaty in 2019 and the near-lapse of the New START Treaty in 2021 created a dangerous vacuum in global security frameworks. Rising geopolitical tensions, particularly between Russia and the West, have escalated fears of renewed arms races that jeopardize decades of achievements in disarmament and nonproliferation.

Objective: The study aimed to evaluate the consequences of weakened arms control mechanisms in the post–Cold War era and to assess the potential pathways for strengthening strategic stability through renewed dialogue and treaty frameworks.

Methods: A qualitative research design was employed using thematic analysis to examine a wide range of secondary sources, including international treaties, governmental reports, non-governmental policy papers, and academic literature. Inclusion criteria required documents to directly address nuclear arms control, disarmament, and strategic stability. Data were coded iteratively, with triangulation from multiple sources to ensure credibility and minimize bias. Ethical standards of scholarship were upheld, and no human participants were involved.

Results: Findings revealed that global stockpiles reduced dramatically from nearly 63,000 nuclear warheads in 1986 to approximately 8,300 today. However, Russia and the United States remain responsible for more than 90% of these weapons and continue expansive modernization programs, including new missile systems, submarines, and strategic bombers. The study identified that the absence of effective verification protocols was a major factor in the collapse of the INF Treaty, and without the renewal of New START to at least 2026, a further erosion of transparency and trust is imminent. Additionally, the integration of emerging technologies—hypersonic weapons, ballistic missile defense, and cyber systems—was found to destabilize the traditional notion of mutual vulnerability.

Conclusion: The study concludes that arms control remains indispensable for global security and stability. Renewing the New START Treaty and integrating broader issues such as third-party arsenals, advanced delivery systems, and space- or cyber-based military capabilities are critical. Strengthened verification measures and revitalized multilateral dialogue are essential for reactivating NATO–Russia cooperation and advancing a verifiable, sustainable path toward disarmament.

Keywords: Arms Control, Cybersecurity, Disarmament, Missile Defense Systems, Nuclear Weapons, Strategic Stability, Treaties.

INTRODUCTION

The end of the Cold War three decades ago marked a period of optimism for global nuclear disarmament, with the United States and Russia together dismantling nearly 40,000 warheads and driving substantial reductions in nuclear stockpiles worldwide. However, this era of progress has been overshadowed by the gradual erosion of arms control frameworks, diminishing public interest, and the resurgence of new military rivalries. Once a pressing concern, nuclear disarmament has lost visibility in both policy debates and public awareness, leading to an alarming decline in momentum despite the persistent destructive potential of nuclear arsenals (1,2). The collapse of landmark treaties such as the 1987 Intermediate-Range Nuclear Forces (INF) Treaty represents a critical turning point in global security, raising fears of renewed proliferation and destabilization. The absence of sustained strategic dialogues between major nuclear powers, coupled with the weakening of preventive agreements such as the 2015 Iran nuclear deal, has further undermined the international arms control architecture. Despite Article VI of the Nuclear Non-Proliferation Treaty (NPT) obligating states to pursue negotiations toward complete disarmament, geopolitical tensions, and the advancement of military technologies, such as those challenging nuclear second-strike capability, have created conditions favorable to a new arms race (3-5). Growing asymmetries between nuclear-armed and non-nuclear states have fueled mistrust in the global governance system. The adoption of the Treaty on the Prohibition of Nuclear Weapons (TPNW) in 2017 by 122 UN member states exemplifies mounting global frustration with the stagnation of disarmament progress and reflects the desire for more binding commitments. Simultaneously, negotiations on key measures such as the Fissile Material Cutoff Treaty (FMCT) remain stalled, while the Comprehensive Nuclear-Test-Ban Treaty (CTBT), though influential, has yet to gain full legal authority. These deadlocks exacerbate the crisis in arms control, impeding the establishment of credible verification mechanisms and weakening normative barriers against nuclear testing (6,7).

The broader implications of this decline extend beyond the loss of treaties. Shifts in global security dynamics, particularly the rise of China as a strategic competitor and the continued nuclear modernization efforts of states such as India, Pakistan, and North Korea, underscore the urgency of revitalizing cooperative disarmament efforts. The fading of public discourse on nuclear dangers has further distanced civil society from shaping arms control agendas, eroding the democratic impetus for disarmament. The absence of active engagement threatens to normalize nuclear armament as a cornerstone of national security strategies rather than an existential risk requiring urgent action (8,9). Against this backdrop, the central question guiding this research is: what impact has the decline of public awareness and political will for arms control since the end of the Cold War had on global security, nuclear proliferation risks, and the trajectory of disarmament? This study critically examines the historical trajectory of arms reduction, the unraveling of treaties, and the emergence of new security dilemmas to highlight how waning commitment to disarmament influences strategic stability. The objective is to provide an evidence-based assessment of these challenges and propose strategies to reinvigorate international cooperation, strengthen legal frameworks, and reengage global civil society in shaping a safer nuclear future.

METHODS

The present study adopted a qualitative research design, guided by thematic analysis, to investigate the implications of declining public awareness and political commitment to nuclear disarmament on global security and strategic stability. Participants in this study were not individuals in the conventional sense but consisted of diverse data sources, including peer-reviewed academic literature, international treaties, governmental and non-governmental policy documents, reports by expert think tanks, and official communications from global disarmament institutions. These sources were included on the basis of their relevance to nuclear arms control, disarmament policy, and security studies. Exclusion criteria were applied to materials lacking sufficient reliability, credibility, or academic rigor, such as opinion pieces or non-verifiable commentaries, in order to ensure accuracy and authenticity of the analyzed data (7). Data collection relied on extensive desk-based research, where primary and secondary documents were retrieved from academic databases, official archives, and international organizational repositories. The emphasis was placed on incorporating sources from both nuclear-armed and non-nuclear states to provide a balanced perspective of the evolving discourse. This breadth of data provided the foundation to explore historical developments, contemporary challenges, and emerging trends in nuclear arms control. Ethical standards were respected in the selection and use of documents, and no personal data or human participants were involved. Consequently, the study was exempt from institutional review board (IRB) approval; however, ethical research practice was observed in line with international scholarly standards, including accurate referencing, transparency, and avoidance of misrepresentation of information (8).

Thematic analysis was employed as the primary method for data interpretation. This involved systematic coding and categorization of the collected materials to identify recurring patterns, hidden themes, and insights into the dynamics of nuclear arms control. Iterative

coding was undertaken across multiple rounds to refine accuracy and ensure reliability. Triangulation of findings was performed by cross-validating evidence from academic articles, treaty records, and policy documents. This method enhanced both the credibility and robustness of the analysis, allowing the study to move beyond descriptive reporting and generate interpretative insights into the strategic implications of reduced arms control commitments (9). Attention was also given to the historical and geopolitical context underpinning the data. For example, the bilateral negotiations between the United States and the Soviet Union following the Cuban Missile Crisis of 1962 highlighted the evolution of arms control as both a stabilizing mechanism and a tool of diplomacy (10). Similarly, the examination of milestone treaties such as the Strategic Arms Limitation Talks (SALT), the Intermediate-Range Nuclear Forces (INF) Treaty, and the New START agreement provided a framework for understanding how disarmament progressed and subsequently regressed in response to shifting political climates (11,12). Thematic analysis also incorporated technological dimensions such as the modernization of nuclear delivery systems, cyber threats, and militarization of outer space, which were coded as emergent themes that complicate contemporary arms control strategies (13).

An important consideration in the methodology was the recognition of inherent limitations. As the study relied entirely on document analysis, it was constrained by the availability and scope of published sources. While this approach ensured breadth and depth of perspectives, it lacked the capacity for first-hand empirical verification through interviews or participant observation. Another limitation is the potential bias in policy documents, which may reflect the strategic narratives of states rather than neutral realities. The research mitigated these issues through triangulation and critical analysis across multiple perspectives, though residual bias may remain. A potential illogicality within this section arises from the reference to “participants” as though the study involved human subjects. In reality, no individuals were recruited, and instead, documents and treaties constituted the unit of analysis. To ensure clarity, the term “data sources” is more appropriate than “participants.” In summary, the methodology ensured a rigorous, transparent, and ethically sound process for analyzing nuclear arms control and disarmament. By employing thematic analysis of diverse and credible sources, the study provided a nuanced interpretation of historical trends, contemporary challenges, and the implications of declining public and political engagement with nuclear arms control.

RESULTS

The study revealed several significant findings regarding the state of nuclear arms control and the challenges undermining disarmament in the post-Cold War era. A consistent decline in political will was identified, primarily driven by escalating geopolitical rivalries, unresolved international conflicts, and renewed modernization programs of major nuclear powers. The deterioration of arms control agreements was evident, with the potential collapse of the New START treaty emerging as a critical threat. The failure to renew this agreement was found to represent the end of the last legally binding verification mechanism between the United States and Russia, thereby removing transparency and creating conditions for a renewed arms race. Meetings on strategic stability between the United States and Russia, held in Geneva in 2018 and 2019, were limited to preliminary discussions and failed to yield substantive negotiations. Despite pledges at the 2018 Helsinki summit, no meaningful agreements were reached. This lack of progress was recorded against the backdrop of advancing military technologies, including ballistic missile defense, precision-guided conventional weapons, space-based reconnaissance, and anti-submarine capabilities. Collectively, these developments increased the theoretical feasibility of a first-strike capability, significantly destabilizing mutual vulnerability, which has historically been the cornerstone of strategic stability. The findings also highlighted the asymmetry in nuclear capabilities, particularly concerning China, whose arsenal remains numerically smaller than those of the United States and Russia. However, China’s relative inferiority was accompanied by heightened risks of miscalculation, while Russia continued to express distrust over U.S. missile defense developments. The modernization of Russian nuclear forces was a key result, with evidence of new high-capacity missile systems such as Yars, Rubezh, Bulava, and Sarmat, along with new Borei-class submarines and modernized strategic bombers like Tu-160. These systems were designed to replace Soviet-era platforms and increase survivability. Russia was also observed to maintain a reserve of nuclear warheads to expand its upload potential, with the capacity to deploy additional warheads under specific strategic circumstances.

Doctrinal analysis demonstrated that Russia’s 2014 military doctrine retained the possibility of nuclear use in cases deemed threatening to state survival. Western assessments indicated that Russia was modernizing its tactical nuclear arsenal, including the development of low-yield warheads and systems such as the 9M729 cruise missile, which allegedly violated the INF Treaty. NATO reports further noted Russia’s integration of nuclear weapons into conventional exercises, reinforcing nuclear signaling against alliance members. In response to U.S. advances in missile defense and precision strike systems, both Russia and China were found to be upgrading their nuclear arsenals. This modernization trend underscored an intensifying arms competition and elevated risks of accidental or deliberate conflict.

Importantly, proposals for strengthening arms control ranged from incremental, phased approaches to broader initiatives such as the Treaty on the Prohibition of Nuclear Weapons (TPNW) and the Global Zero concept. However, the findings showed that neither approach, when pursued in isolation, was sufficient to address current risks, underscoring the interdependence of gradual reductions and ambitious disarmament frameworks. Overall, the results demonstrated that the erosion of traditional arms control mechanisms, combined with new technological developments and declining political engagement, had created a precarious security environment. The scale of existing nuclear arsenals, estimated at approximately 8,300 warheads compared to 63,000 during the peak of the Cold War, highlighted substantial reductions in the past. Yet, modernization efforts by major powers indicated that progress toward disarmament had stalled, with risks of renewed competition on the rise.

DISCUSSION

The findings of this study demonstrated that the preservation and advancement of nuclear arms control face severe challenges due to declining political will, unresolved international conflicts, and rapid technological progress. These results align with previous literature which emphasized that the post–Cold War optimism surrounding disarmament has gradually eroded, leaving fragile treaties under immense pressure. Earlier research showed that treaties such as the INF and New START were pivotal in reducing stockpiles and building mutual trust, yet the weakening of these frameworks now signals a dangerous shift toward renewed nuclear competition. The present analysis confirms these observations by illustrating how modernization programs in both Russia and China have been directly influenced by perceived imbalances created by U.S. missile defense systems and precision-strike capabilities (14-16). The interpretation of strategic stability is becoming increasingly complex in the current geopolitical environment. Historical periods of relative equilibrium in the 1980s and 1990s were built on mutual vulnerability and verified agreements, whereas present conditions are marked by advanced ballistic missile defense, space-based reconnaissance, and cyber-related threats. These developments alter deterrence calculations by raising the feasibility of a first-strike capability, a conclusion supported by existing scholarship that warns of the destabilizing role of technological superiority (17,18). The findings of this study highlight that the risks of miscalculation or accidental escalation are now higher than in earlier decades, particularly given the absence of legally binding verification systems.

The study also reinforced concerns that China's comparatively smaller arsenal creates vulnerabilities that amplify instability. Previous analyses suggested that asymmetries among nuclear powers fuel mistrust and arms modernization, which is consistent with the evidence showing Russia and China advancing new missile systems, bombers, and submarines (19,20). Russia's adoption of doctrines permitting nuclear use under circumstances of perceived existential threat demonstrates that doctrinal ambiguity persists, raising the threshold for misinterpretation during crises. Western assessments of Russian tactical nuclear developments, including low-yield warheads and missile systems violating treaty obligations, add further weight to the argument that arms control has lost its restraining influence. The implications of these findings are significant for both global security and international governance. The erosion of arms control not only weakens crisis stability but also undermines decades of progress in transparency and verification. Proposals such as the TPNW or incremental phased reductions provide avenues for progress, yet their isolated application is insufficient. A combined strategy that integrates ambitious goals with gradual, verifiable steps emerges as essential for achieving meaningful disarmament (21-23). This aligns with the historical observation that successful agreements required both political will and practical verification mechanisms, underscoring the need for renewed cooperation between nuclear powers.

The strengths of this study lie in its comprehensive qualitative methodology, which synthesized diverse data sources, including treaties, policy documents, and expert analyses. This broad approach allowed the extraction of recurring themes and the identification of interrelated drivers of instability. The emphasis on triangulation improved the credibility of the findings, while the thematic analysis provided interpretative insights beyond simple description. Another strength was the integration of historical and contemporary perspectives, allowing for a nuanced understanding of continuity and change in arms control dynamics. Nonetheless, limitations were present. The reliance on secondary document analysis restricted the capacity to capture real-time decision-making processes within governments. Biases embedded within policy documents or national statements may have influenced the interpretation of motives and intentions. Additionally, the study lacked quantitative modeling of nuclear force balances, which could have provided stronger empirical support for conclusions regarding strategic stability. Future research should address these limitations by combining qualitative insights with quantitative assessments of nuclear arsenals, budgetary allocations, and technological advancements (24). Expanding the scope to include perspectives from smaller nuclear powers and non-nuclear states would also strengthen the applicability of the findings. In conclusion, the study confirmed that declining commitment to nuclear arms control, combined with technological modernization and geopolitical rivalry, has created an unstable security environment that threatens to undo decades of disarmament progress. While

historical precedents demonstrated that dialogue and verification were effective in reducing risks, the absence of these mechanisms today leaves the global system vulnerable to escalation and miscalculation. The findings emphasized the urgent need for renewed international cooperation, integrated strategies for disarmament, and policies that address both technological challenges and political divisions to minimize the likelihood of nuclear conflict in the twenty-first century.

CONCLUSION

In conclusion, the study underscored that the preservation and renewal of nuclear arms control mechanisms remain essential to sustaining global security and preventing a resurgence of destabilizing arms races. The findings emphasized that meaningful progress depends on renewed dialogue between nuclear-armed states, particularly the United States and Russia, alongside the strengthening of multilateral frameworks such as the NPT, CTBT, and future fissile material agreements. Bridging the divide between traditional non-proliferation commitments and newer disarmament initiatives is critical to achieving verifiable reductions and restoring confidence in global governance. The research highlights that the challenges of advancing military technologies, shifting geopolitical rivalries, and declining political will can only be managed through cooperative measures, transparency, and verification. By reinforcing established treaties, adapting arms control to contemporary threats, and fostering mutual restraint, the international community can move closer to a sustainable pathway toward disarmament and a safer, more stable world.

AUTHOR CONTRIBUTION

Author	Contribution
Zeeshan Ahmad*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published

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