



Assessing Research Trends on Military Risk and Safety: An Integrated Scientometric and Scoping Study

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ABSTRACT

This study investigates the evolution of research on risk assessment in military contexts through an integrated scientometric analysis and scoping review. Utilizing publications indexed in Scopus and Web of Science, the analysis delineates publication growth, thematic development, and methodological trends within the field. Scientometric findings indicate a consistent increase in scholarly interest since the 1990s, with publication activity peaking around 2016 and maintaining elevated levels thereafter. Keyword and co-occurrence analyses demonstrate that research on military risk assessment has expanded from a primarily safety-centric orientation to a broader, multidisciplinary domain encompassing psychological health, suicide, veterans' well-being, epidemiology, operational safety, and risk management. The scoping review further reveals that contemporary studies predominantly concentrate on health-related, behavioral, and occupational risks among military personnel, with salient topics including sleep quality, cardiovascular risk, post-traumatic stress disorder, infectious disease transmission, road safety, and hepatitis exposure. Methodological diversity is also evident, encompassing cross-sectional studies, systematic reviews, meta-analyses, and scoping reviews. Despite this expansion, the field exhibits fragmentation, characterized by limited structural coherence, underrepresentation of female military personnel, and insufficient application of advanced analytical models in operational settings. These findings suggest that while research on military risk assessment is becoming increasingly interdisciplinary, substantive gaps persist in the integration of behavioral, organizational, and technological perspectives into holistic risk frameworks. This study contributes a systematic mapping of the intellectual structure of the field, identifying emergent themes and underexplored areas to inform future research, policy development, and military risk management practices.

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1. Introduction

Military organizations are confronted with considerable challenges stemming from the inherent uncertainties and elevated operational tempo characteristic of their environments, which expose personnel to a range of physical and psychological hazards. Acute Stress Reactions (ASRs) are frequently observed among military personnel, necessitating a stepped care model for effective intervention, encompassing detection, assessment, and treatment modalities [31]. Furthermore, sleep deprivation and compromised sleep quality are pervasive within military contexts, demonstrating correlations with heightened engagement in high-risk behaviors, such as reckless driving and substance abuse, thereby underscoring the exigency for enhanced sleep management policies [29,44]. Augmenting situation awareness through the implementation of fuzzy logic systems may further assist military personnel in navigating complex operational environments, thus optimizing decision-making processes under duress [16]. Finally, the cultivation of organizational resilience through the incorporation of mindfulness-based interventions may better equip military units to effectively respond to crises, ultimately bolstering operational effectiveness [13]. Synthesizing these observations underscores the multifaceted nature of the risks encountered by military personnel and the concomitant imperative for comprehensive mitigation strategies.

In the past two decades, military risk assessment research has expanded its scope to encompass disciplines such as occupational safety and health, psychology, epidemiology, and organizational studies. This interdisciplinary evolution underscores the necessity of adopting multifaceted perspectives on risk, as evidenced by the growing emphasis on psychological health and occupational stressors affecting military personnel, particularly those serving in high-stress environments [14,43]. Furthermore, the integration of fuzzy logic methodologies into military operational planning highlights the demand for sophisticated risk assessment techniques capable of addressing the inherent complexities and ambiguities characteristic of military operations [35]. The focus on safety culture and mental health within occupational health and safety management further elucidates the critical nexus between individual well-being and organizational performance [38,42,57]. This holistic comprehension is paramount for the development of enhanced risk management strategies, which are indispensable for both the efficacy of military operations and the welfare of personnel [12].

Although research on military risk assessment is growing, the field still lacks structural coherence and maturity. Existing studies examine various aspects of risk assessment in emergency services, including military applications. However, these studies are often isolated and specific to particular service contexts, hindering the development of a unified, interdisciplinary framework [37]. Furthermore, the politicization of risk management complicates a comprehensive understanding of risk assessment, highlighting the need for a more nuanced approach that considers social, cultural, and psychological factors [50]. While related fields like urban resilience and banking risk are moving toward more adaptive and holistic methodologies [39,48], similar progress in military risk assessment is urgently needed. Innovative modeling approaches, such as weighted Bayesian networks for consequence assessment, show potential for improving military risk assessment methodologies, but their widespread adoption remains limited. As a result, a gap remains in our understanding of the key research themes, methodological trends, and emerging areas that define the current state of military risk assessment research.

To address this limitation, a systematic mapping of the field's intellectual development is crucial. Scientometric analysis offers a quantitative method for examining publication trends, research productivity, and thematic structures within a body of literature. Synthesizing this analysis with a scoping review enables a more comprehensive understanding of how research topics, methodologies, and knowledge domains have evolved over time.

Therefore, this study aims to **systematically analyse the evolution of research on risk assessment within military contexts** through the integration of scientometric analysis and scoping review methodologies to delineate publication trends, dominant research themes, and methodological developments within the field. Accordingly, this study addresses the following research question:

RQ: How has research on risk assessment in military contexts evolved, with specific consideration of publication trends, thematic focus, and methodological approaches?

This study offers several notable contributions to the existing literature on military risk assessment. First, deviating from prior reviews that predominantly address specific facets such as psychological risks, operational hazards, or occupational safety, this study furnishes a more holistic synthesis of the field by integrating multiple dimensions of risk assessment within military contexts. Second, this review advances the literature by employing a combined scientometric analysis and scoping review approach, facilitating a systematic mapping of publication trends, thematic structures, and methodological developments in research pertaining to military risk assessment. Third, the study identifies emergent research clusters, underexplored themes, and methodological patterns that have not been explicitly highlighted in previous reviews. Through this integrated analytical approach, the study provides a more refined understanding of the intellectual landscape of military risk assessment and establishes a foundation for future research endeavors aimed at developing more comprehensive and context-specific risk assessment frameworks for military organizations.

2. Method and Analysis Design

2.1 Scientometric Analysis

Scientometric analysis is a widely recognized method for analyzing and comprehending large volumes of scientific data, enabling us to gain a deeper understanding of the intricacies of a field's development [18]. The utilization of scientometric parameters to evaluate the quality of research output is increasing in intensity. Researchers employ scientometric analysis for various purposes, such as identifying emerging trends and assessing journal performance [53], exploring collaboration patterns and research components [56], examining publication trends within a research domain [4], and investigating the intellectual structure of a specific area in published works [49]. The present study employs scientometric analysis to observe the patterns of research publications on risk assessment, identify the countries actively engaged in publishing, and scrutinize the themes and subthemes conveyed through authors' keywords.

2.2 Scoping Analysis

The primary objective of conducting scoping reviews is to identify and document the diverse range of evidence that is available [33]. Therefore, the present study aims to examine the key elements associated with risk assessment within military context publications in order to synthesize the existing literature in this research field. This scoping review has been carried out to identify gaps in knowledge and identify areas that require further investigation. The five-step scoping review framework proposed by Arksey and O'Malley [10] was employed for this study:

- 1) Establishing the research question.
- 2) Identifying relevant studies.
- 3) Selecting studies.

- 4) Data charting.
- 5) Reporting results.

2.3 Establishing Research Question

The following research question serves as the basis for scoping analysis in this study:

- 1) Based on the SPIDER (Sample, Phenomenon of Interest, Design, Evaluation, Research Type) tool [15], What are the most crucial findings from previous studies regarding risk assessment in military environments?

2.4 Identifying Relevant Studies

2.4.1 Database

Accessing publications in scientific journals, institutional repositories, archives, and other collections of materials requires the use of databases and search engines [4]. For the purpose of this study, the Scopus and WoS databases were utilized to analyze scientometric and scoping indicators. The selection of these databases is justified as the impact of document citations is more significant in these databases compared to others [55]. Furthermore, from a statistical perspective, elements such as metadata accuracy, document category classification, and discipline assignment have been adjusted to enhance the validity of the coverage analysis. Therefore, Scopus and WoS prioritize these factors [51].

2.4.2 Search strategy

After identifying keywords, an encyclopedia is utilized to locate synonymous terms. Table 1 displays the search strings employed to acquire publication lists from the Scopus and WoS databases. The search was carried out in June 2024, encompassing the titles, abstracts, and keywords within both databases. It is important to note that no limitations were imposed on the retrieved data during this phase, including date, publication type, or language.

Table 1
Search strategy for extracting data from the Web of Science and Scopus databases

Database	Search Strategy	Records
Web of Science	Topic: ("risk assessment" OR "Risk evaluation" OR "Risk analysis" OR "Risk audit" OR "Risk study") AND ("military" OR "army" OR "navy" OR "air forces" OR "Armed Forces" OR "Soldier")	1040
Scopus	Article Title, Abstract, Keywords:("risk assessment" OR "Risk evaluation" OR "Risk analysis" OR "Risk audit" OR "Risk study") AND ("military" OR "army" OR "navy" OR "air forces" OR "Armed Forces" OR "Soldier")	6395

2.4.3 Software

This study utilized two software tools, namely ScientoPy and VOSviewer. ScientoPy is a Python script that generates and presents the primary subjects, authors, countries, and associated documents based on author-generated keywords [47]. This automated data synthesis approach helps to minimize potential biases arising from separate investigations. However, it is important to acknowledge the possibility of bias when examining studies that employ author name analysis, as there may be similarities in names [47]. The VOSviewer software, developed by Van Eck and Waltman [54], enables co-occurrence analyses of keywords related to risk assessment within the military

context. The visual elements of VOSviewer are produced through mapping techniques that transform CSV data into diagrams or clusters [1]. These mapping strategies hold potential benefits for researchers in analyzing specific data points, including authors' keywords [5,41].

3. Selecting Studies

3.1 Publications Merge and Removal of Duplicates

The data derived from both databases were compiled and processed utilizing ScientoPy. During this stage, the data is standardized through the substitution of commas in the author's name with semicolons, the elimination of dots, commas, and unique formatting from the author's name, and the removal of duplicate entries with identical titles and authors. This methodology augments the precision and dependability of the datasets. The outcomes of the preprocessed data are presented in Diagram 1.

Adhering to the PRISMA framework, this review employed a structured study selection process to ensure transparency in the identification, screening, eligibility assessment, and inclusion of pertinent studies. To enhance the consistency of study selection, the screening process was conducted in accordance with predefined inclusion and exclusion criteria, with uncertainties resolved through iterative evaluation of retrieved records to ensure alignment with the review objective. Given the study's adoption of a scientometric analysis combined with a scoping review approach, the emphasis was placed on mapping publication trends, thematic development, and methodological patterns, rather than on conducting a formal critical appraisal of study quality. Consequently, while a formal inter-rater reliability coefficient and detailed quality appraisal were not the primary focus of the present review design, these elements should be considered in future evidence synthesis studies to further strengthen methodological rigour.

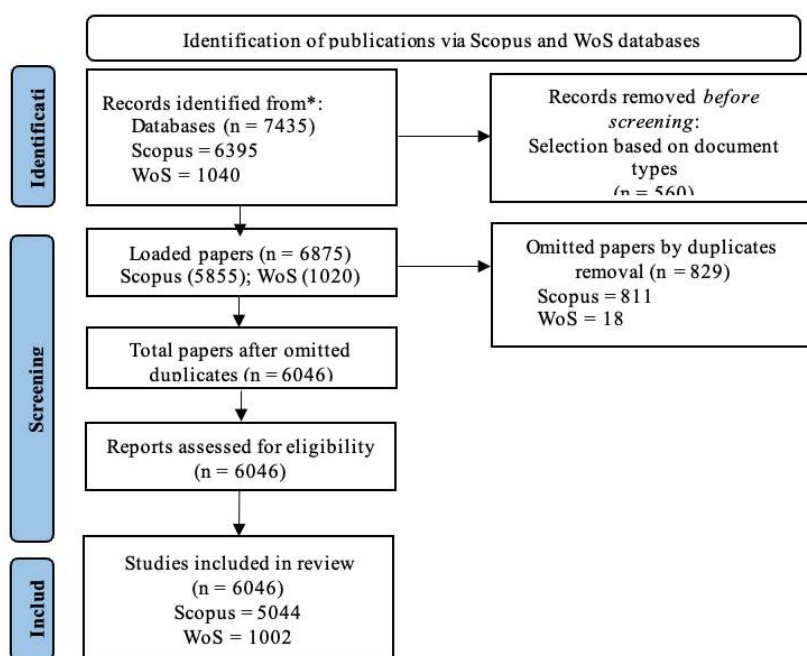


Fig. 1. Flow diagram of research of databases and registers

The preprocessing script implemented in ScientoPy assigns higher priority to WoS documents in comparison to Scopus documents. Based on the findings presented in Figure 1, it can be observed that Scopus, despite its greater magnitude, demonstrated a higher prevalence of redundancy, as

indicated by the removal of 14% of its documents due to duplication. In contrast, WoS, characterized by a smaller dataset, exhibited a mere 2% duplication rate, thus implying a greater degree of distinctive content within its document collection. Diagram 1 supplements this information, indicating that the source dataset encompasses 7435 papers and incorporates entries from both the WoS and Scopus databases. ScientoPy's automated categorization of publications into various categories, such as conference papers, articles, reviews, proceedings papers, and press pieces, resulted in the exclusion of 829 documents, such as books, letters, and errata. Following the data reconciliation process, this study utilized a total of 6046 entries from both databases, comprised of 1002 papers from WoS and 5044 from Scopus. Furthermore, 811 duplicate entries from Scopus and 18 from WoS were eliminated.

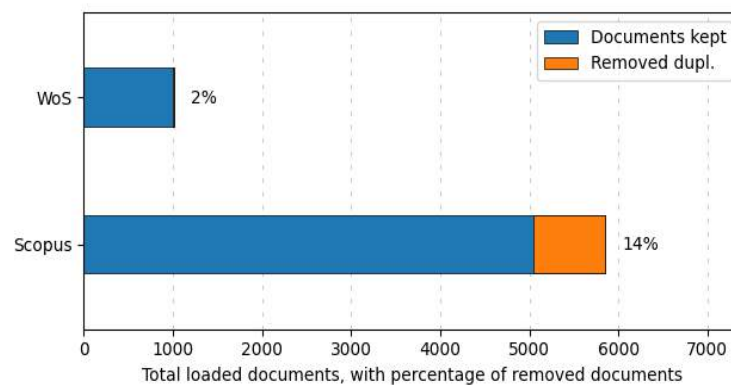


Fig. 1. Data combination and duplicates removal

3.2 Data Charting

The publication growth graph depicts the progression of publishing in the Scopus and WoS databases. This data holds significant value in comprehending the overall trend of publications. In order to furnish a more comprehensive understanding of the articles chosen in the preceding stage, we conduct an analysis of the evolution graph pertaining to the top 10 authors' keywords and scrutinize the co-occurrence of these keywords.

3.2 Reporting Results

In line with the objectives of this study, a succinct summary and report of the findings were prepared. The use of ScientoPy facilitated the analysis of publication growth, identification of active countries, and examination of keywords. VOSviewer was utilized as a descriptive metric to determine the co-occurrence of authors' keywords. It is worth noting that a minimum of two keywords is necessary to generate co-occurrence results for authors' keywords using VOSviewer. Additionally, the thesaurus files were carefully examined and modified, taking into consideration the recommendation by Abdullah *et al.*, [5] as a precautionary measure to prevent duplication of authors' keywords.

The purpose of the scoping review methodology is to present a comprehensive overview of the existing research in a particular field. One of the primary motivations for undertaking a scoping study is to identify any gaps or deficiencies in the current body of research. In this specific study, our objective was to thoroughly examine and describe the current state of research on risk assessment, while also identifying areas where the literature is lacking. To carry out this analysis, we utilized articles sourced from Scopus and WoS, which were preprocessed using ScientoPy. The specific criteria for inclusion in this scoping review can be found in Table 2.

- 1) Written in English.
- 2) Publications from 2013 and later.
- 3) Describe primary research.
- 4) Use the keyword military personal in the authors keywords.

4. Results

4.1 Scientometric Outcome

4.1.1 Publication growth

The graph depicted in this study showcases a substantial surge in the quantity of publications starting from 1992, with a notable emphasis on the late 1990s and reaching its pinnacle in 2016 (see figure 2). The data utilized for this analysis was obtained from the Scopus database. While there have been minor fluctuations observed since 2016, the number of publications has consistently remained at a high level, indicating sustained interest and ongoing research endeavors concerning military risk assessment. In stark contrast, a different pattern emerges when examining the trend within the WoS database. The number of publications commences at a lower level, experiences a marginal increase, and subsequently stabilizes during the early 2000s. However, after 2000, there is a gradual decline in publication numbers. This observation suggests that either the database's focus on indexing has shifted away from this specific topic or that it potentially provides relatively limited coverage of sources relevant to military risk assessment compared to Scopus.

The increasing publication volume on military risk assessment over time demonstrates a growing academic interest and underscores the intricacies of risks in military operations. This pattern underscores the significance of continued dialogue among scholars, military subject matter experts (SMEs), and occupational safety and health (OSH) professionals. By fostering open communication and collaboration among these stakeholders, the field can capitalize on the convergence of theoretical advancements, practical insights, and safety considerations. These interactions play a crucial role in the development of comprehensive and innovative risk assessment strategies that enhance both research and practical applications in military contexts. This active interdisciplinary engagement is vital for effectively addressing the evolving challenges in military risk assessment.

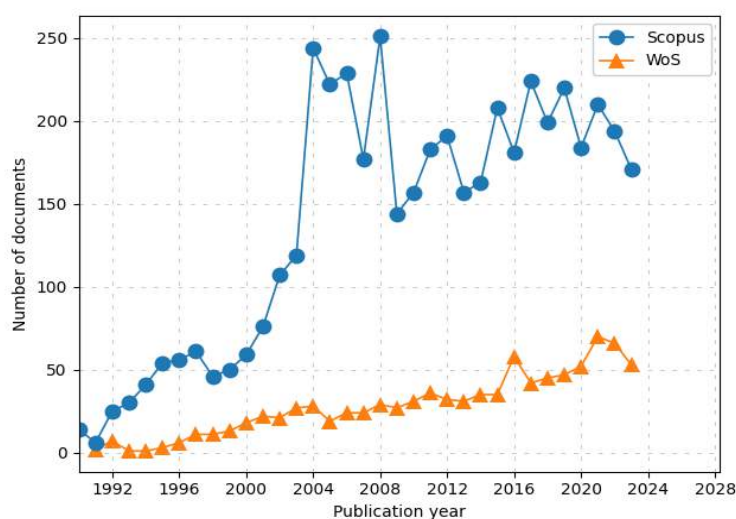


Fig. 2. The evolution of publication growth (Source: Author, using ScientoPy 2.1.3)

4.1.2 The most influential academic works

Figure 3 illustrates the distribution of publication periods among the most influential academic institutions in the United States specialized in military risk assessment. The upper bar graph presents the overall number of documents published by each institution, distinguishing between publications prior to 2022 and during the years 2022-2023. Notably, the Uniformed Services University of the Health Sciences (USUHS) and Boston University emerge as prominent contributors, with 20% and 21% of their respective publications falling within the aforementioned timeframe. The lower time series plot depicts the publication trends over time, utilizing data from the Scopus and WoS databases. Collectively, these graphs provide insight into the evolving academic interest in military risk assessment, shedding light on key institutions and publication patterns, thereby emphasizing the significance of continued research and discourse in this domain.

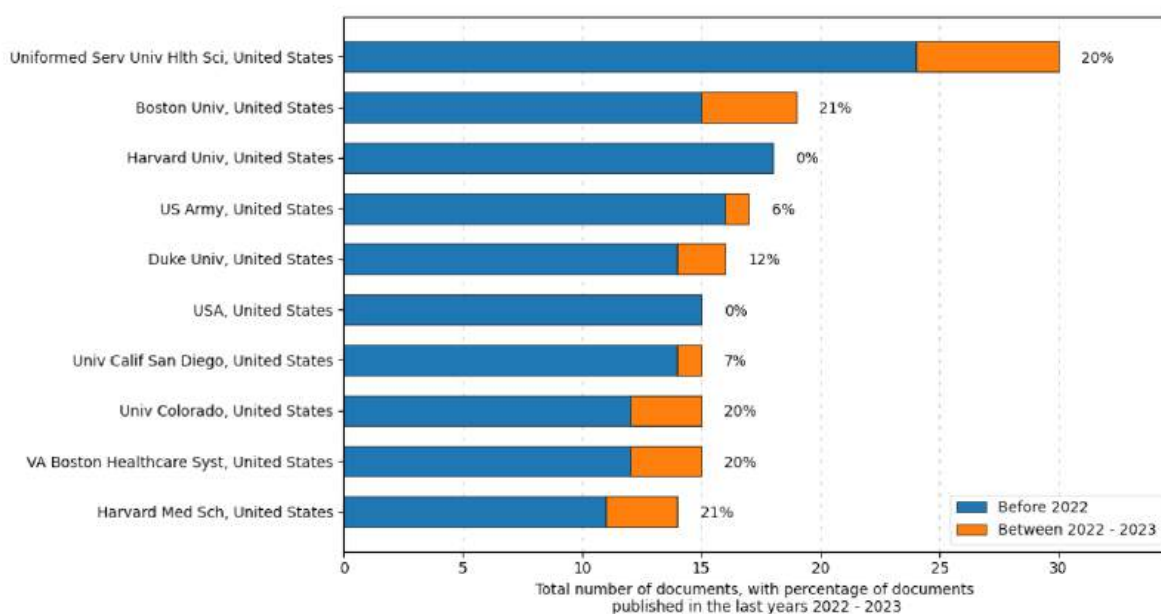


Fig. 3. Institution bar trends graph

4.2 Authors' Keywords

Figure 4 illustrates the distribution of authors' keywords pertaining to risk assessment in the military in a visual format. The figure provides information on the total number of published documents and the percentage of these publications between 2022 and 2023. The keyword "Military" exhibits the highest number of publications overall and represents a significant portion (12%) of recent publications. "Risk assessment" closely follows with a slightly higher recent publication rate (16%). Furthermore, keywords such as "Suicide" and "Veterans" demonstrate notable recent activity, with 15% of their total publications occurring in the past two years. This highlights the emergence of these research areas. Conversely, keywords such as "Epidemiology," "Risk factors," "Risk," "Military personnel," "Risk management," and "Risk analysis" exhibit variability in terms of their total counts and recent activity, reflecting the diverse depth of research and emerging interests in recent years. This distribution of keywords underscores the wide-ranging and evolving nature of research topics in the field of military risk assessment. It indicates both established areas of focus and newer, emerging topics that are of interest to researchers.

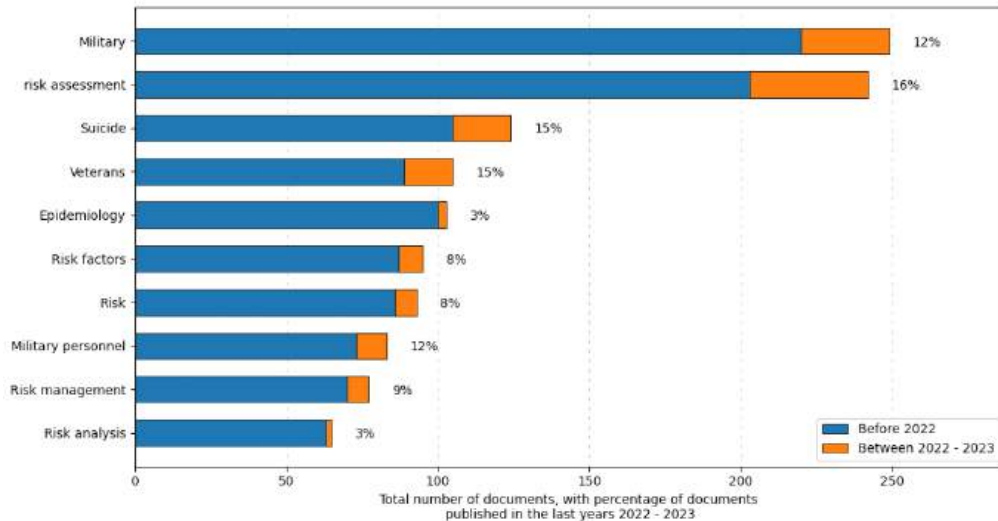


Fig. 4. The bar-trend graph of research themes and topics emerging (Source: Author, using ScientoPy 2.1.3)

Figure 5 presents a scientometric visualization generated using VOSviewer, a specialized tool for analyzing scientific literature. The visualization elucidates the interrelationships and evolution of authors' keywords within the domain of military risk assessment from 2010 to 2020. The central node, labeled as "risk assessment," assumes a central role in this visualization, exhibiting connections with various other pertinent topics. The color gradient, spanning from blue to red, serves as an indication of the shifting emphasis on specific keywords over time. Notably, terms such as "military," "veterans," "suicide," and "mental health" are closely linked, underscoring the paramount importance attributed to psychological risks and health outcomes. Furthermore, conspicuous connections exist with keywords like "exposure assessment," "ecological risk assessment," and "risk management," which encompass both the environmental and strategic dimensions of military operations. This network visualization furnishes a comprehensive perspective on the interconnected and multifaceted character of research within the field of military risk assessment, encompassing an array of topics ranging from direct health hazards to broader ecological and strategic considerations.

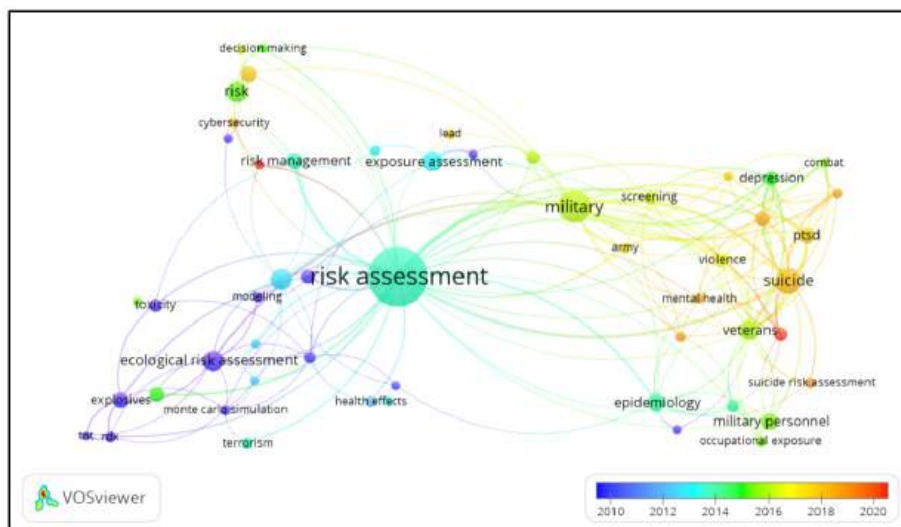


Fig. 5. Co-occurrence of authors' keywords

4.3 Scoping Outcomes

This section provides a comprehensive examination of the extent to which risk assessment is addressed in military-related publications. This analysis serves as a crucial initial step in identifying areas of knowledge deficiency and guiding future research endeavors, thereby contributing to the existing body of knowledge and best practices. To conduct a scoping analysis, qualitative research questions were formulated, and the SPIDER tool was employed as the search strategy in this study. Table 3 presents a compilation of publications based on extended author keywords obtained from ScientoPy. Initially, the information in Table 2 was condensed from a total of 47 documents. It is important to note that this study focuses specifically on the scoping analysis of research articles, which resulted in the exclusion of the other 39 records that were not categorized as research papers at this stage.

Table 2
 List of inclusive publications

No	Sources	Sample	Phenomenon of Interest	Design	Evaluation	Research Type
1.	Guo et al., (2023)	1,832 men who are in the military and answered questions online about their sleep and marriage life from July to November 2021	how being married or not and living with a spouse or not affects sleep quality, sleepiness, and beliefs about sleep in male military personnel	Uses inverse probability weighting and logistic regression to analyze how marital status affects sleep-related outcomes	Assesses sleep quality, sleepiness, and sleep beliefs in male military personnel using validated scales	Quantitative
2.	Ratković et al., (2022)	205 active-duty military personnel, all male, with an average age of 39 years, exploring the relationship between high-sensitivity C-reactive protein and cardiovascular risk factors	how high-sensitivity C-reactive protein (hs-CRP), a marker of inflammation, is related to traditional risk factors for heart disease among active-duty military personnel in Serbia	Examines the link between high-sensitivity C-reactive protein and traditional coronary heart disease risk factors using a cross-sectional approach	Assesses absolute cardiovascular risk using the SCORE system and standardized tests for blood pressure and plasma lipid levels	Observation
3.	Wang et al., [57]	The research included 16 studies with a total of 11,880 participants, covering military personnel from various geographical	How common Helicobacter pylori (H. pylori) infection is among military personnel and to identify what increases the chances of getting this	Uses meta-regression and subgroup analyses to explore how factors like region, publication year, and diagnostic methods	The study reports a 32% prevalence of H. pylori infection among military personnel, with familial aggregation, living environment,	Quantitative

		locations including Asia, Europe, and North America	infection in this specific group	influence H. pylori infection prevalence.	and age as key risk factors, and uses the Newcastle-Ottawa Scale and AHRQ for data quality assessment	
4.	Obuobi-Donkor et al., [36]	The scoping review included studies with a total of 306,173 subjects, focusing on the prevalence and predictors of PTSD among military personnel and firefighters from various global regions including North America, Asia, Europe, Africa, and Australia, covering research published between 2005 and 2021	investigates the prevalence and causes of PTSD among military personnel and firefighters, emphasizing the mental health challenges associated with these high-risk professions. It delves into various factors that may elevate the risk of PTSD in these groups, including occupational hazards, the level of social support, individual injuries sustained, and personal characteristics	Synthesize data on the prevalence and risk factors of PTSD in military personnel and firefighters, offering a comprehensive overview of existing research	Examines the high prevalence of PTSD among firefighters and military personnel, influenced by trauma, job stress, and social support, and stresses the need for targeted prevention and research on its complex determinants	Scoping review
5.	Bird et al., (2021)	The article includes studies with a wide range of sample sizes, from a study with 1,004 participants assessing the importance of sex to studies with smaller participant numbers, like the one with 156 participants examining premature ejaculation	Examines the impact of PTSD on sexual difficulties among veterans and military personnel, focusing on aspects such as sexual function, desire, satisfaction, and distress. It explores the complex links between PTSD and various sexual outcomes, emphasizing how specific PTSD	Analyze how PTSD affects sexual function, desire, satisfaction, and distress among veterans and military personnel, utilizing diverse methodologies across selected studies	Systematically reviews 43 studies to evaluate PTSD's association with various sexual difficulties in veterans and military personnel, uncovering complex impacts on sexual desire, satisfaction, and distress, while noting mixed results	Systematic review

		and PTSD relationships	symptoms like avoidance and cognitive/mood changes contribute to these challenges. The study highlights the critical need to understand the intricate connections between mental health and sexual well-being in this population		for arousal and orgasm function. It highlights methodological limitations like inconsistent measurements and calls for future research to enhance study designs and consider factors such as gender and trauma history for a clearer understanding of PTSD's effects on sexual health	
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5. Discussion

Based on the keyword analysis, it is evident that the military is most strongly correlated with notational analysis, multivariate analysis, and kinetics. This finding highlights the pivotal role of notational analysis in enhancing the safety, performance, and overall efficacy of military missions. By enabling a proactive approach to risk management and operational optimization, notational analysis proves indispensable. Furthermore, the importance of dependability in notational analysis should not be underestimated. Obuobi-Donkor *et al.*, [36] discovered that their study on notational analysis of the military demonstrates a high degree of dependability. Furthermore, their findings are deemed reliable due to the incorporation of multiple perspectives, thereby enhancing the overall trustworthiness of the conclusions.

The Risk Assessment is a topic of great interest that warrants further investigation. It has become increasingly important in recent years, particularly in the field of risk management within military contexts. Assessing and managing risks in military populations is a complex undertaking due to a variety of exposures, long periods of latency, and a lack of data on vulnerable subgroups. This presents challenges in establishing links between hazards and health outcomes. In military settings, risk management involves evaluating and mitigating risks to ensure operational effectiveness and safety [22]. This process includes identifying key risk factors, implementing safety controls, and prioritizing interventions based on risk assessments [11,52]. Taking a proactive approach to risk is vital in the military, viewing it not only as a threat but also as an opportunity for improvement and growth. By incorporating risk management tools and strategies, military organizations can enhance their decision-making processes and achieve better operational outcomes in challenging and dynamic environments.

To gain a deeper understanding of how the military environment contributes to the risk of suicide among its members, it is crucial to examine various factors that intensify this correlation. Previous research has demonstrated that exposure to suicide within the military can result in negative psychological outcomes, including symptoms of post-traumatic stress disorder (PTSD), anxiety, and

insomnia [19,40]. Furthermore, several factors have been identified as increasing the risk of suicide attempts following a major depression diagnosis. These factors include lower levels of education, specific military occupational roles (such as combat medics), certain psychiatric diagnoses (such as bipolar disorder and traumatic stress), and adherence to traditional masculine gender role norms (such as emotional control and violence) [23,46]. Additionally, stigmatizing beliefs about suicide within the military can discourage individuals from seeking help, highlighting the importance of addressing military suicide stigma in prevention efforts [30]. (Therefore, when conducting risk assessments, it is essential to consider factors such as exposure to suicide, educational background, occupational roles, psychiatric diagnoses, adherence to gender norms, and stigma-related beliefs in order to effectively evaluate the risk of suicide among military members. In summary, the relationship between risk assessment and suicide is mutually reinforcing and interconnected, as discussed above.

Based on a scoping analysis, eight studies have been published in journals indexed by Scopus and WoS since 2013. These studies have found that the majority of research samples consist of male military personnel. Consequently, there has been comparatively less research conducted on female military personnel. Risk assessment in military contexts tends to primarily focus on male military personnel due to various reasons highlighted in the research. Studies indicate that male victimization, such as sexual assault in the military, is an under-researched topic, leading to a lack of awareness and understanding of the specific risks faced by men in the military [27]. Moreover, research on relationship conflict and intimate partner violence after deployment primarily concentrates on male military personnel, highlighting factors such as childhood adversity, trauma exposure, mental health issues, and alcohol misuse as key risk indicators [9]. While there is growing concern about non-specific chronic low back pain among male soldiers, the prevalence and risk factors for this condition have predominantly been studied in male military populations [32]. Therefore, the existing literature gap regarding the understanding of risks faced by female military personnel contributes to the predominant focus on risk assessment among male military individuals.

The phenomenon of interest in risk assessment within a military context encompasses a wide range of subjects. These include the impact of marital status on sleep quality [7], the cardiovascular risks associated with inflammation markers, the prevalence of *Helicobacter pylori* [57], the causes of PTSD, sexual difficulties related to PTSD, attitudes towards road safety education, the role of military personnel in spreading infectious diseases, and hepatitis B and C infections. Each study employs different research designs, such as cross-sectional surveys, systematic reviews, and scoping reviews, to examine specific areas of interest. These may include health risks, behavioral risks, and infection risks among military personnel. The objective of these findings is to enhance understanding and promote preventive measures within military contexts.

While this study offers a systematic review of military risk assessment research, several methodological limitations warrant consideration. First, the scientometric analysis may be subject to citation bias, wherein highly cited publications gain disproportionate visibility, potentially obscuring nascent but less-cited research. Second, language bias may be present, as the review primarily encompasses publications indexed in major databases that predominantly feature English-language articles. Furthermore, database indexing bias may arise, given that not all pertinent studies are indexed within the selected databases, potentially constraining the comprehensiveness of the literature captured in this review.

6. Conclusion

This study systematically investigates the evolution of research on risk assessment in military contexts through the integration of scientometric analysis and a scoping review methodology. The results demonstrate a progressive increase in scholarly publications over time, indicative of growing academic interest in understanding risk-related issues within military environments. Scientometric mapping further delineates several prominent research clusters, particularly those pertaining to psychological risks, operational safety, military culture, and methodological frameworks for risk assessment. These patterns suggest an evolution of military risk assessment research from a predominantly safety-centric perspective toward a more multidisciplinary field incorporating behavioral, organizational, and technological dimensions.

Theoretically, this study contributes to the literature by providing a comprehensive mapping of the intellectual structure and thematic evolution of research on military risk assessment. By combining scientometric techniques with scoping review methods, the study advances beyond previous narrative reviews, offering a more refined understanding of the development of research themes, methodological approaches, and knowledge domains within this field. The findings also highlight the uneven distribution of research focus across different risk domains, indicating disparities in scholarly attention.

In terms of practical implications, the findings provide valuable insights for military organizations seeking to enhance their risk management practices. The identification of dominant research themes and emerging methodological approaches can assist policymakers, military planners, and safety practitioners in understanding current knowledge trends and adopting more comprehensive risk assessment strategies. In particular, the integration of behavioral, organizational, and technological perspectives may enhance the effectiveness of risk management frameworks in addressing the complex and dynamic nature of military operations.

Notwithstanding these contributions, several lacunae persist in the extant literature. Future research should explore underexamined areas such as operational risk assessment in active military environments, the integration of advanced analytical models in military risk evaluation, and the influence of emerging technologies on risk management practices. Addressing these areas will facilitate the development of more comprehensive, context-sensitive, and evidence-based risk assessment frameworks that can support operational safety and decision-making in contemporary military organizations.

Ethical considerations

Not applicable.

Conflict of Interest

The authors disclosed no conflicts of interest.

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