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# Exploring the Potential Health, Social, Cultural and Economic Benefits of Consanguineous Unions: A Systematic Review

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## Abstract

# Background

Consanguineous marriages, defined as unions between individuals who are related closely by blood, have been a common practice in many cultures and societies throughout history. They have significant implications for both health and social outcomes. While these unions are often scrutinized for the increased risk of genetic disorders in the offspring, it is equally important to explore the potential benefits that they may offer. These can span various domains, including health, social, cultural and economic benefits.

# Aim

This review aimed to comprehensively examine and synthesize the evidence on the potential benefits of consanguineous unions, contributing to the understanding of these unions.

# Methods

A systematic review was conducted according to the PRISMA-2020 guidelines in June 2025. PubMed, Scopus, CINAHL, and Google Scholar were searched for eligible articles according to predefined inclusion and exclusion criteria. Studies focusing on some or the other positive impact of consanguineous marriages were sought. Studies focusing solely on the genetic risks or disadvantages of consanguineous marriages, studies with insufficient data on potential benefits, case reports, editorials, and opinion pieces without empirical data were excluded.

# Results

Based on our inclusion criteria and exclusion criteria, a total of seven articles were finally found eligible for the review. While consanguineous marriages are associated with certain genetic risks, researches suggest certain social, economic, and potential health advantages. These unions are found to reinforce socio-economic status and social capital within families. These marriages support inter-generational continuity, allowing family traditions and cultural values to endure across generations, which contributes to the cohesion and stability of communities where such unions are common. The support from extended family may improve resilience against stress and illness, showing that familial cohesion in consanguineous families can serve as a protective factor in challenging times. Regarding health benefits, these unions help in maintaining desirable genetic traits, offer resistance to certain diseases such as malaria and are found to improve sensitivity to chemotherapy in cancer patients.

# Conclusion

This review highlights that while consanguineous unions do present with genetic challenges, they also may offer social, cultural, economic, and certain health-related benefits. There is a need to weigh the risks and benefits of such unions before outrightly discouraging them based only on medical considerations.

## Introduction

Consanguineous marriages, defined as unions between individuals who are related closely by blood, have been a common practice in many cultures and societies throughout history (1). Consanguineous marriages have significant implications for both health and social outcomes. On the health front, there is a clear association with increased risks of congenital anomalies, genetic disorders, and adverse pregnancy outcomes such as stillbirths, abortions, and miscarriages (2, 3). Consanguineous marriages are also found associated with inborn errors of metabolism, poor growth of child and intellectual disability (4, 5). While these marriages are often scrutinized for their genetic risks, it is equally important to explore the potential benefits that they may offer (6). These benefits can span various domains, including social, economic, cultural, genetic and even some scientific aspects (7–8). Consanguineous marriages are associated with maintaining family structure, property, and better relationships with in-laws, which can lead to financial advantages and ease of marital arrangements (9). These marriages are seen as promoting family stability and have lower rates of separation and divorce (10). Consanguinity also has advantages at the scientific level besides being associated with various hazards. A few studies indicate the protective role of consanguinity against breast cancer and multiple sclerosis (11, 12).

The scope of this review is to specifically address the positive aspects of consanguinity. Despite extensive literature on the potential adverse consequences of consanguinity, evidence concerning potentially favourable social, cultural, economic and health-related associations has received comparatively less synthesis. This review, therefore, aims to comprehensively map, examine and synthesize the available evidence. on the potential advantages of consanguineous marriages contributing to the understanding of these unions. The findings are expected to offer insights into the social, economic, cultural, and genetic aspects that may support the practice in various communities, thereby informing public health and cultural policies.

## Objectives

- To identify and analyse studies that have reported on the benefits of consanguineous marriages across different populations.
- To explore the social, cultural, and economic advantages that consanguineous marriages may provide within communities where this practice is prevalent.
- To investigate any potential genetic or health-related benefits that may arise from consanguineous unions.

- To assess the overall impact of these marriages on family dynamics, inheritance patterns, and community cohesion.

## Methodology

A systematic review synthesizing findings from studies that address various dimensions of consanguineous marriages, including social, cultural, economic, genetic, and health-related aspects was performed in June, 2025. Research publications were identified through 4 databases i.e. PubMed, Embase, CINAHL, and Google Scholar focusing on studies which highlight some or the other positive aspects/impact of consanguineous marriages. The study reporting was done in accordance with PRISMA-2020 (13).

Following search terms were explored; “consanguineous marriage”, "consanguineous marriages," "cousin marriages," "kin marriages" AND, "benefits," "advantages," “health benefits”, "positive outcomes," "economic benefits," "social cohesion," "cultural preservation," "genetic traits". Figure 1 shows the search strategy flow diagram followed in the data compilation and detailed Search strategy is added as Supplementary Material.

Inclusion Criteria for the study were studies published in peer-reviewed journals, studies reporting on the benefits or advantages of consanguineous marriages Identify all empirical evidence concerning social, economic, cultural and health outcomes associated with consanguinity, and subsequently categorize findings as potentially beneficial, neutral, or harmful, and studies published in English. Both qualitative and quantitative studies conducted in various cultural, social, and economic contexts were assessed and analysed. Studies focusing solely on the genetic risks or disadvantages of consanguineous marriages, studies with insufficient data on potential benefits, case reports, editorials, and opinion pieces without empirical data were excluded. The selected articles were tabulated incorporating information about authors, year of publication, type of publication and main findings/conclusion. Common themes regarding benefits of consanguineous marriages were identified after thorough review of the included studies and the outcome measures were tabulated as the type of benefits reported (social, economic, cultural, genetic and health), and specific findings related to each benefit. The review was prospectively registered on the Open Science Framework (OSF) with registration DOI https://doi.org/10.17605/OSF.IO/Y8JC7.

## Results

# Study selection

The systematic search of PubMed, Embase, CINAHL, and Google Scholar identified **708 potentially relevant records**, comprising 141 records from PubMed, 88 from Embase, 399 from CINAHL, and 80 from Google Scholar. Following removal of 129 duplicate records, **579 unique records** remained for title and abstract screening. Of these, 553 records were excluded because they did not meet the predefined

eligibility criteria, including 300 excluded based on title screening and 253 following abstract assessment.

Twenty-six articles were subsequently sought for full-text retrieval. One article could not be retrieved, leaving 25 articles for full-text assessment. Eighteen articles were excluded at this stage, because the reported outcomes were not aligned with the objectives of the review (n = 15); two were review articles and one was a book. Consequently, **seven studies were included in the final synthesis** based on the inclusion criteria. (Fig. 1). The included studies encompassed a range of methodological approaches, including a workshop report, observational study, secondary-data analysis, ethnographic qualitative study, cohort study, analytical study, and prospective study. The diversity of study designs and outcome measures precluded quantitative pooling of the findings; therefore, a qualitative thematic synthesis was undertaken.

## Characteristics of included studies

The seven included studies were published between 2007 and 2021 and represented diverse geographical and sociocultural settings, including Spain, the USA, Jordan, Qatar, Italy, and India and consisted of a range of study types, including workshop reports, observational studies, ethnographic qualitative studies, cohort studies, and secondary data analyses (Table 1). The methodological and contextual heterogeneity of the studies was considerable.

Table 1
Summary table of articles included in the review

| Sr No. | Author (year) | Country | Article type/Method | Main findings/conclusion |
|---|---|---|---|---|
| 1 | Hamamy H et al. (2011) [14] | Spain | Workshop report | These unions reinforce trust and familial ties, providing a resilient support network in regions with limited external social support systems. The presumptive social benefits of consanguineous marriages need to be confirmed by evidence-based research. |
| 2 | Mobarak AM et al. (2019) [15] | USA | Observational study | The study found that previous estimates of the impact of consanguinity on child health were biased and falsely precise. The study also empirically investigated the social and economic causes of consanguinity (including marital quality) and concludes that marrying a cousin can have positive economic effects for one's natal family, by allowing deferral of dowry payments until after marriage. |
| 3 | Islam MM et al. (2021) [16] | Jordan | Secondary data analysis | Despite its potential social benefits like reduced risk of divorce or separation, polygyny and increased survival of marriage, its negative health consequences should not be overlooked. policy intervention needs to be undertaken in Jordan in a culturally acceptable manner to reduce consanguinity and its health burden. |
| 4 | Kilshaw S et al. (2015) [17] | Qatar | Ethnographic qualitative study | The discourse on genetic risk associated with marrying in the family was familiar, but for some participants, the benefits of close marriage outweighed potential risks. Furthermore, the introduction of mandatory pre-marital screening gave participants confidence that risks were monitored and minimized. |
| 5 | Bhopal RS et al. (2014) [18] | Italy | Cohort study | The issue of the potential risks and benefits of consanguineous marriages is of international relevance. The international literature on the potential benefits of consanguineous marriages is sparse and has mostly come from lower- and middle-income countries. The potential advantages are social, psychological, health-related lifestyle and economic. |
| 6 | Denic S et al. (2007) [19] | USA | Analytical study | Consanguineous marriages are a socially driven phenomenon that could be genetically beneficial in the presence of malaria. The authors hypothesized that human inbreeding may have sped up the emergence of some of the most common genetic conditions in humans that are known to protect against malaria. |

| Sr No. | Author (year) | Country | Article type/Method | Main findings/conclusion |
|---|---|---|---|---|
| 7 | Saadat M et al. (2011) [20] | India | Prospective study | Considering that homozygosity increased due to parental consanguineous marriages, taken together it might be suggested that the observed association is due to homozygosity of relatively rare alleles involved in clinical response to chemotherapy. |

Hamamy et al. (14) described potential social advantages of consanguineous unions in a workshop report, particularly stronger familial relationships, trust and social support. Mobarak et al. (15) examined socioeconomic and health-related consequences of cousin marriage in South Asia, including potential economic advantages for the natal family. Islam et al. (16) used population-based data from Jordan to examine marriage stability and reported associations with reduced divorce or separation and greater marital survival. Kilshaw et al. (17) used ethnographic methods in Qatar to explore how individuals and families perceived the balance between genetic risks and perceived advantages of marriage within the family.

The Born in Bradford cohort study examined potential social, psychological, lifestyle and economic dimensions of consanguineous marriages (18). Denic et al. (19) explored a possible genetic mechanism through which consanguinity might contribute to selection of genotypes associated with malaria resistance. Saadat et al. (20) investigated the association between parental consanguinity and response to chemotherapy among patients with locally advanced breast cancer.

The available evidence was predominantly observational or descriptive, with substantial variation in population characteristics, exposure definitions, outcome measures and analytical methods.

## Social and familial benefits

The most consistently reported potential benefits related to **familial relationships, social cohesion and marital stability**. Most of the included studies described consanguineous unions as strengthening pre-existing family networks and facilitating trust, mutual assistance and social support. These relationships were particularly relevant in communities in which the extended family represents an important source of emotional, social and material support (Table 2).

Table 2

**Potential benefits of consanguineous marriage reported in the literature**

| Sr. | Theme | Benefits | Description |
|---|---|---|---|
| 1 | **Social Benefits** | Increased familial harmony and unity | Consanguineous marriages are believed to foster stronger familial bonds and support systems [14,16] |
| | | Greater cultural and religious alignment | Partners from the same family often share cultural values, traditions, and religious beliefs, minimizing conflicts [14] |
| | | Enhanced marital stability | Reduced divorce rates are observed in consanguineous marriages, possibly due to greater familial support [14,16] |
| 2 | **Cultural Benefits** | Increased likelihood of strong family support in illness or adversity | Families involved in consanguineous marriages tend to provide robust support during health crises [17] |
| | | Enhanced emotional stability for children through close-knit family relations | Children in consanguineous families often benefit from extensive family support, fostering emotional security [17,18] |
| | | Greater likelihood of alignment in parenting and lifestyle choices | Families share similar beliefs and values, leading to more harmonious upbringing and consistent parenting styles [18] |
| 3 | **Economic Benefits** | Financial savings on dowries and wedding expenses | Families may save money as dowry expectations are often lower or non-existent within the family network [15] |
| | | Wealth preservation within the family | Property and wealth are more likely to remain within the family lineage, preventing dispersion of assets [18] |
| 4 | **Genetic and health Benefits** | Maintenance of desirable genetic traits | Consanguinity can help preserve certain advantageous genetic traits within family lines, such as physical traits [19] |
| | | Resistance to disease | Consanguinity could facilitate the selection of genotypes that confer resistance to diseases such as malaria [19] |
| | | Sensitivity to chemotherapy | Better response to chemotherapy in breast cancer patients [20] |

The included literature suggested that marriage between relatives may facilitate continuity of established family relationships and may reduce the social distance between spouses and their respective families. Shared family networks were described as potentially providing support during illness, financial difficulty and other periods of adversity.

Evidence regarding **marital stability** was also identified. The study from Jordan reported associations between consanguineous marriage and lower divorce or separation, reduced polygyny, and greater

marital survival (16).

Overall, the evidence suggests a potential association between consanguineous unions and stronger familial support structures, but it does not establish that consanguinity itself causes improved family cohesion or marital stability.

# Cultural benefits

Cultural continuity emerged as another recurring theme. The ethnographic evidence from Qatar indicated that marriage within the extended family may be perceived as a mechanism for preserving cultural identity, traditions and shared values across generations. Shared cultural, social and religious backgrounds were also described as potentially facilitating compatibility between partners and reducing perceived interpersonal or familial conflict (17).

The review also identified potential emotional and psychosocial benefits arising from close-knit family structures. Strong extended-family networks may provide emotional reassurance and practical support during periods of illness, bereavement, financial stress or other adversity. The Born in Bradford study was particularly relevant to this dimension, identifying potential social and psychological benefits associated with familial networks (18).

However, these findings largely represent **context-dependent social advantages** rather than biological effects of consanguinity. Their relevance may vary substantially between populations according to family structure, social support systems, gender roles, economic circumstances and cultural norms.

## Economic benefits

Potential economic benefits were identified in several studies. Consanguineous unions may facilitate the retention of wealth and property within extended families and may reduce some of the financial costs associated with marriage.

The reviewed evidence suggested that family-based marriages can contribute to preservation of property and financial assets within the extended family. In some settings, reduced dowry requirements or other marriage-related expenses may decrease the immediate financial burden associated with marriage.

Mobarak et al. (15) specifically examined socioeconomic mechanisms underlying cousin marriage and suggested that such unions may have economic consequences for the natal family, including potential advantages related to the timing and transfer of dowry. However, the authors also highlighted potential biases and limitations in previous estimates of the health and socioeconomic effects of consanguinity.

Thus, the economic advantages identified in the literature appear to arise primarily from **family-level resource sharing and existing socioeconomic relationships**, rather than from consanguinity as an

independent economic determinant.

## Potential genetic and health-related benefits

The evidence for health-related benefits was considerably more limited and heterogeneous than that for social and economic outcomes.

Denic et al. (19) proposed that consanguinity might facilitate the selection or maintenance of genetic variants associated with resistance to infectious diseases such as malaria in populations exposed to endemic malaria. This represents a biologically plausible hypothesis concerning population-level genetic selection, but it cannot be interpreted as evidence that consanguineous marriage provides a general health advantage to individuals or families.

Another included study by Saadat et al. (20) investigated the association between parental consanguinity and chemotherapy response in patients with locally advanced breast cancer. The findings showed that increased homozygosity might influence genetic variants associated with treatment response. However, this evidence was derived from a specific clinical population and cannot be generalized to overall health benefits of consanguinity.

The review also identified literature describing preservation of particular familial genetic characteristics. However, these observations remain context-specific and should not be interpreted as evidence that consanguinity generally preserves “desirable” genes or improves population health.

# Overall synthesis

Across the seven included studies, four broad domains of potential benefit were identified: **social, cultural, economic, and genetic/health-related**.

The social domain included stronger familial bonds, increased social support and potentially greater marital stability. The cultural domain included preservation of family traditions, shared values and cultural identity, together with emotional support during adversity. Economic benefits included potential reduction in marriage-related expenses and preservation of family wealth and assets. The genetic/health domain included hypotheses concerning preservation of particular genetic traits, possible malaria resistance and possible differences in chemotherapy response.

# Heterogeneity of evidence

Considerable heterogeneity was observed in study design, geographical setting, population characteristics and outcome definitions. The included evidence ranged from qualitative ethnographic research and workshop reports to observational, cohort, prospective and analytical studies. Consequently, direct comparison across studies was difficult.

Furthermore, many of the reported benefits were based on perceptions, contextual associations or proposed mechanisms rather than prospectively measured clinical outcomes. This heterogeneity prevented meaningful meta-analysis.

## Discussion

This systematic review explored the potential advantages of consanguineous marriages across social, cultural, economic, and health-related domains. Seven studies met the predefined eligibility criteria, encompassing diverse populations and study designs. Overall, the available literature suggests that consanguineous unions may provide **familial, social, cultural and economic advantages in some settings**, while evidence for specific genetic or health-related benefits remains limited and highly context dependent. Importantly, the findings should not be interpreted as evidence that consanguinity is inherently beneficial, nor should the reported social advantages be considered to negate the established genetic risks associated with increased biological relatedness.

One of the most consistent themes was the role of consanguinity in **strengthening existing family and social networks**. The Geneva International Consanguinity Workshop report described close family relationships as an important source of trust, social support and resilience, particularly in communities where extended-family networks constitute an important component of the informal social-support system (14). Such relationships may facilitate assistance during illness, financial difficulties and other periods of adversity. The Born in Bradford cohort study similarly highlighted potential social and psychological dimensions of consanguineous marriage, including the role of extended-family networks in providing support (18).

These observations are important because the perceived value of consanguinity cannot be separated from the **social environment in which marriage decisions are made**. In communities characterized by strong extended-family structures, marrying within the family may maintain pre-existing social capital and provide continuity of interpersonal relationships. However, these advantages may reflect the broader characteristics of close-knit families rather than an independent effect of biological relatedness. Therefore, attributing improved social support specifically to consanguinity should be approached cautiously.

The review also identified a possible association between consanguineous marriage and **marital stability**. The secondary-data analysis from Jordan reported lower divorce or separation, lower polygyny and greater marriage survival among consanguineous unions (16). These findings are consistent with the possibility that shared family networks, cultural compatibility and greater involvement of extended families may influence marital stability. However, lower divorce rates cannot necessarily be interpreted as evidence of better marital quality. Divorce and separation are themselves strongly influenced by social norms, economic dependence, gender roles, family expectations and the availability of social support. Thus, future studies should distinguish between marital duration and measures of marital satisfaction, psychological well-being and relationship quality.

# Cultural and intergenerational dimensions

Another important finding was the potential role of consanguinity in **cultural continuity and preservation of family identity**. The ethnographic study from Qatar indicated that some participants regarded the perceived advantages of marrying within the family as outweighing potential genetic risks. The introduction of premarital screening also provided participants with reassurance that genetic risks could be identified and potentially mitigated (17).

This finding emphasizes that consanguinity is not simply a biomedical phenomenon but is embedded within cultural and familial decision-making. Shared traditions, values, social expectations and family relationships may influence the perceived desirability of such unions. Consequently, public-health approaches that simply characterize consanguinity as an undesirable practice may be ineffective or culturally insensitive. Instead, culturally responsive counselling should acknowledge the social and emotional motivations underlying these decisions while providing accurate information regarding genetic risks and available preventive services.

# Economic considerations

Potential **economic advantages** were another recurring theme. The review identified preservation of wealth and property within extended families, reduced marriage-related expenses and potential reductions or postponement of dowry-related financial obligations as reported benefits. Mobarak et al. (15) specifically examined the socioeconomic mechanisms underlying cousin marriage and reported that such unions may generate positive economic effects for the natal family, including the possibility of deferring dowry payments.

These findings suggest that consanguineous marriage may function partly as a **social and economic institution**, facilitating the transfer and retention of resources within established family networks. Nevertheless, these potential economic benefits are likely to be highly context specific. They may depend on local inheritance practices, dowry systems, household structure, property ownership and socioeconomic status. Therefore, they should not be generalized across populations without considering local circumstances.

# Potential health and genetic benefits

The evidence concerning potential health-related or genetic benefits was substantially weaker than that concerning social and cultural outcomes. Denic et al. (19) proposed that consanguinity could theoretically facilitate the selection of genetic variants associated with protection against malaria in populations historically exposed to endemic malaria. This represents an interesting evolutionary hypothesis, but it does not establish a direct health benefit of consanguineous marriage at the individual or family level.

Similarly, Saadat et al. (20) examined parental consanguinity in relation to chemotherapy response among patients with locally advanced breast cancer and suggested that genetic similarity could

influence treatment response. The specificity of this population and outcome means that the finding cannot be extrapolated to a general health benefit associated with consanguinity.

Accordingly, the health-related findings should be considered hypothesis-generating rather than evidence of clinical benefit. The current evidence base does not justify recommending consanguinity as a means of improving resistance to infectious diseases, cancer outcomes or other health conditions.

# Balancing potential benefits against established risks

While few potential health benefits exist, the established risks associated with consanguinity remain significant (21). Consanguineous marriages can increase the likelihood of genetic disorders due to shared genetic backgrounds. Conditions such as congenital anomalies, metabolic disorders, and certain cancers have been documented at higher rates among offspring of consanguineous unions (22–24).

Therefore, the finding of social, economic and cultural benefits along with potential health benefits of consanguinity should **not be interpreted as a justification for disregarding genetic risks**. The 20th International Consanguinity Workshop emphasized on the importance of understanding these risks within specific cultural and societal frameworks rather than generalizing them globally (14). The evidence suggests that consanguinity represents a complex practice in which perceived benefits and potential harms coexist.

This distinction is particularly relevant for genetic counselling. Counselling should avoid stigmatizing individuals or communities where consanguinity is culturally prevalent. Instead, counselling should provide balanced information concerning risks, family history, available carrier screening, premarital screening where appropriate, reproductive options and the implications of repeated consanguinity across generations. The findings from the Qatar study suggest that premarital screening may provide reassurance to couples who wish to marry within their family while enabling identification of relevant genetic risks (17).

# Implications for public health and genetic counselling

The findings have implications for the way consanguinity is addressed in public-health practice. Policies based solely on discouraging consanguineous marriage may fail to address the social, cultural and economic motivations that sustain the practice. A more appropriate approach would combine **culturally sensitive counselling with accessible genetic-risk assessment and preventive services**.

Healthcare professionals should recognize the importance of family relationships and social support while ensuring that individuals understand potential genetic consequences. Premarital and preconception counselling, carrier screening where appropriate, family-history assessment and access to genetic services may allow couples to make informed reproductive decisions without stigmatization.

The findings also support the need for context-specific interventions. The perceived benefits and risks of consanguinity may differ according to the degree of biological relatedness, population genetic

background, prevalence of recessive disorders, healthcare access and local marriage and inheritance practices. Consequently, a uniform global policy approach may be inappropriate.

# Strengths and limitations

The review has several strengths. It specifically examined an under-synthesized aspect of consanguinity-the potential benefits-while retaining consideration of established risks. The search incorporated four major information sources, and both quantitative and qualitative studies were considered. The review also categorized reported outcomes into social, cultural, economic, genetic and health-related domains, facilitating a multidimensional interpretation.

However, several limitations should be acknowledged. First, only **seven studies** were ultimately included, limiting the breadth and certainty of conclusions. Second, the search was restricted to **English-language publications**, potentially excluding culturally relevant evidence published in other languages. Third, searches were conducted in PubMed, Scopus, CINAHL and Google Scholar, and relevant studies indexed elsewhere or published in regional journals may therefore have been missed. Fourth, there were substantial heterogeneity in study designs and outcomes of the included studies, which complicated synthesis and may have obscured context-specific insights.

In addition, several included studies were observational, qualitative or hypothesis-generating in nature. Consequently, associations should not be interpreted as causal effects.

# Conclusion

This systematic review highlights that, while consanguineous marriages present genetic challenges, they also may offer social, economic, cultural and potential health-related benefits. The findings indicate that these unions strengthen familial support networks, promote marital stability, and contribute to economic resilience, especially in communities with limited external social support. Additionally, there may be protective genetic adaptations within consanguineous populations, particularly in regions with endemic diseases. Future research should continue exploring these benefits to provide a balanced perspective on consanguinity, enabling culturally sensitive genetic counselling and healthcare support in regions where consanguineous marriages are prevalent. Consanguinity should therefore not be characterized as inherently beneficial or harmful on the basis of the current evidence. Future comparative and longitudinal studies using clearly defined exposure categories and validated outcomes are needed to clarify the independent potentially beneficial effects of consanguinity.

# Declarations

*Ethics, Consent to Participate, and Consent to Publish declarations* Not applicable

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*Conflict of interest* None declared

*Data availability* The data analysed in this review consists of published article obtained through systematic search of databases. All such articles have been cited in the articles and have been properly put as references. Qualified researchers interested in replicating this study or requiring additional details are encouraged to contact the corresponding authors for further information.

# Author Contribution

MAB and IAK contributed to the study conception and design. Literatutre search, data collection and analysis were performed by IAKand NB. The first draft of the manuscript was written by IAK and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript

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# Figures

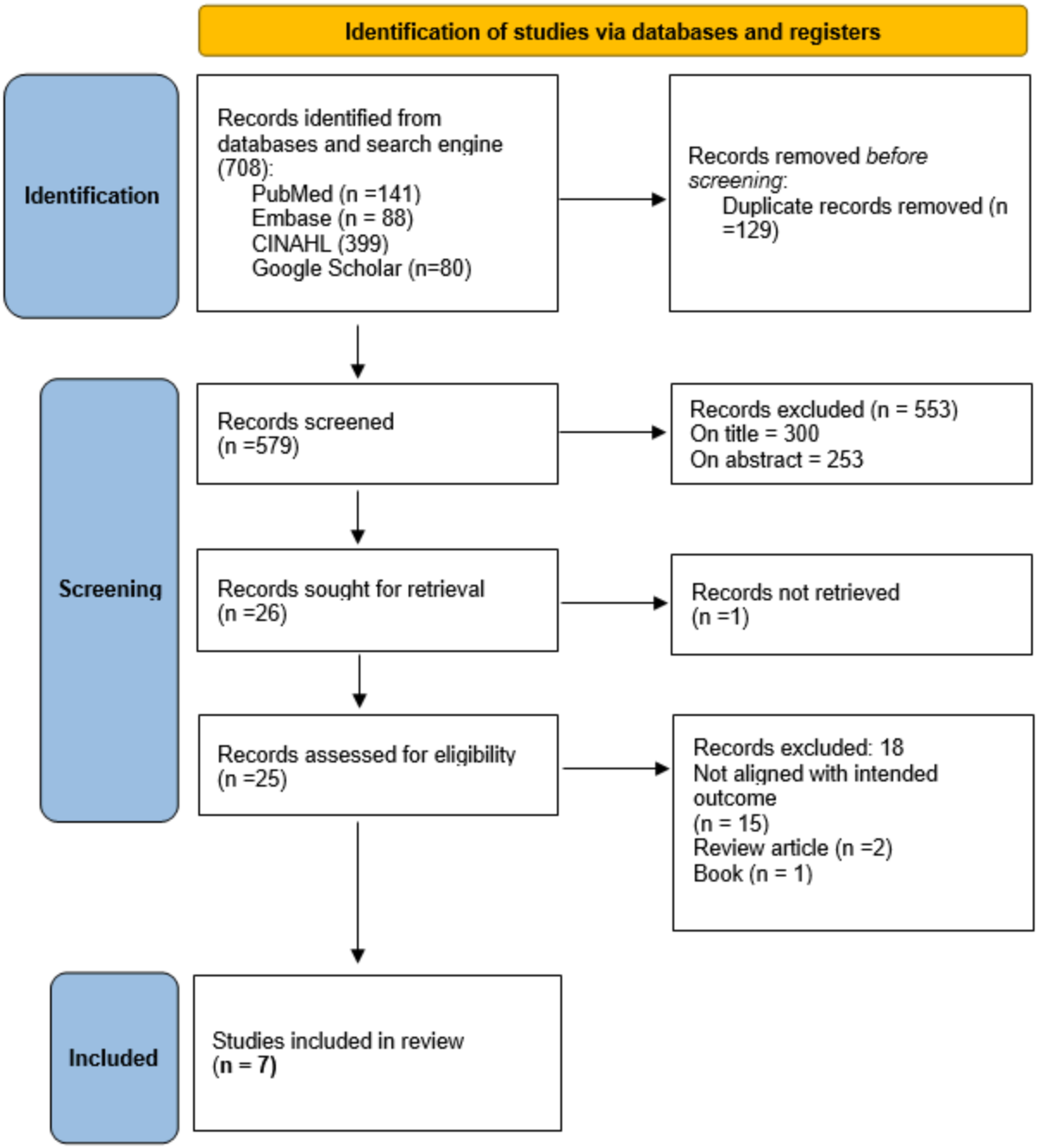


**Figure 1**

**PRISMA flow diagram of the search strategy adopted for the review**

# Supplementary Files

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- Searchstrategy.docx