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Systematic review or meta-analysis

Prevalence of hepatitis C viral infection in Somalia: A systematic review and meta-analysis

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ABSTRACT

Background: The incidence of hepatitis C Virus (HCV) in Somalia is still of major epidemiological significance. This study aims to determine the prevalence of HCV in Somalia through a systematic review and meta-analysis of published studies. Methods: We conducted a comprehensive search across five electronic databases (Web of Science, PubMed, ScienceDirect, Scopus, and Google Scholar) using specific keywords to address the impact of HCV in Somalia following the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines. A meta-analysis was performed on our eligible studies using the random effect model. Results: Our search returned 15 eligible articles involving 1565 HCV cases in 88782 participants. These studies, conducted between 1992 and 2023 in Somalia provided diverse data on HCV prevalence. The overall pooled prevalence of HCV in Somalia was 3.5% (95% CI: 2.0% - 5.9%, I²=97.4%). Subgroup analyses revealed variations in prevalence across study designs, detection methods, and publication years. Notably, cross-sectional design had a higher prevalence rate (4.7%) than retrospective study designs (2.3%). The detection methods also influenced prevalence rates, PCR having the highest incidence rate (4.4%) and PCR/ELISA having the lowest estimate (2.2%). The year of publication significantly influenced the prevalence of HCV in Somalia at P<0.001. Conclusion: The study highlights the significant burden of HCV in Somalia. The findings underscore the need for targeted public health interventions and improved surveillance to manage and control HCV infection in Somalia and other African countries.

Introduction

Hepatitis C virus (HCV) infection is a major worldwide health concern that leads to longterm liver disorders, such as cirrhosis and hepatocellular cancer [1,2]. The World Health Organization (WHO) reports that there are around 71 million individuals worldwide who are currently afflicted with chronic HCV infection [3] Africa carries a significant proportion of the worldwide burden of HCV, with the frequency of the virus varying greatly across different regions [4]. However, there is a lack of comprehensive and organized data on the epidemiology of HCV in several African countries, including Somalia [4].

Somalia, located in the Horn of Africa, has undergone extended periods of conflict, political instability, and economic difficulties, which have had a devastating impact on its healthcare infrastructure [5]. These conditions are thought to contribute to the transmission of infectious illnesses, including HCV [6]. The lack of extensive data on the incidence of HCV in Somalia obstructs the

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development of efficient public health initiatives and interventions [7].

In Somalia, the primary mode of HCV transmission is thought to be using hazardous medical practices [8]. These factors encompass the practice of reusing needles and syringes, insufficient sterilization of medical equipment, and transfusions that involve blood products that have not been tested [9–11]. In addition, socio-economic factors such as poverty, inadequate education, and restricted availability of high-quality healthcare facilities contribute to the heightened susceptibility of the population to HCV infection [12,13]. A comprehensive examination is required to fully comprehend the actual impact of HCV in Somalia due to the intricate interaction of these components.

Prior research on the prevalence of HCV in Somalia has yielded diverse outcomes [8,14,15]. Certain research reveals a comparatively elevated prevalence, whilst other studies propose lower rates. The variations seen can be ascribed to disparities in the design of the studies, the demographic characteristics of the populations, and the diagnostic techniques employed [16]. The wide range of differences emphasizes the necessity of doing a systematic review and meta-analysis to gather and analyze all the available data thoroughly [17, 18]. This methodology can provide a more precise estimation of HCV prevalence in Somalia, taking into consideration biases and methodological variations among individual researches.

The outcomes of recent research will be carefully evaluated, with any inconsistencies or potential biases being looked at through a thorough review and meta-analysis. Combining data from multiple sources improves the accuracy of calculating the prevalence of HCV. Furthermore, it can identify unexplored and understudied study regions, contributing to a more comprehensive understanding of HCV epidemiology in Somalia. A thorough examination is crucial for providing information to guide health policy decisions and allocate resources for HCV prevention, diagnosis, and treatment efforts in Somalia [16].

Gaining insight into the epidemiology of HCV in Somalia is not only essential for national health planning but also in line with global health objectives. The WHO has established a challenging objective to eradicate the Hepatitis C Virus (HCV) as a significant risk to public health by the year 2030 [19]. To accomplish this objective, obtaining precise statistics on the prevalence of HCV is necessary to inform and implement effective intervention measures. In a country like Somalia, where healthcare resources are scarce, implementing a knowledgeable strategy for managing the Hepatitis C virus (HCV) can have a substantial effect on the overall health outcomes of the population. This study is aimed at determining the pooled prevalence of HCV in Somalia, through a systematic review and meta-analysis of published data on the subject.

Method

Data Search, Eligibility, and Extraction

Before initiating this review, we conducted a preliminary search on two major review databases, PROSPERO and DARE, to ensure the uniqueness of this study and avoid any redundancy or overlap with existing or ongoing research. Adhering strictly to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines [20], we undertook a comprehensive search across five prominent global electronic databases: PubMed, Google Scholar, Scopus, ScienceDirect, and Web of Science. We aimed to identify literature relevant to the prevalence of hepatitis C in Somalia.

The search strategy employed a combination of specific key terms, including "Hepatitis C" OR "HCV" AND "prevalence" OR "occurrence" OR "epidemiology" OR "incidence" AND "Somalia." This meticulous approach ensured the inclusion of a broad spectrum of studies, ranging from cross-sectional analyses and retrospective cohort studies. Crucially, for inclusion in this review, studies had to have been conducted within the geographical confines of Somalia.

We excluded studies based on the following criteria: (1) review articles, (2) editorials, (3) those without a clearly defined origin, (4) studies containing redundant or duplicate data, (5) research conducted outside of Somalia, and (6) studies for which the full text was unavailable. Studies carried out in Somalia without a clear description of it examined sample pool and the number of positive cases were excluded, despite meeting some of the inclusion criteria, as the prevalence for such studies can not be determined by the available data. Three authors (B. K. E., A. S. A., and Y. A.) independently screened the titles, abstracts, and full texts of the identified studies, adhering to pre-established inclusion criteria. Any disputes were resolved by consensus.

For data extraction, we utilized a standardized table to capture essential details, including author names, publication year, prevalence of hepatitis C, and study design. Supplementary File 1 provides additional information about the search methodology.

Statistical Analysis and Quality Assessment

We employed a single-arm random-effects model to calculate the pooled prevalence of hepatitis C in Somalia across all included studies. This approach, based on the DerSimonian and Laird technique [21], was implemented using OpenMeta and Comprehensive Meta-Analysis Software.

To assess publication bias, we utilized a funnel plot [22]. The Cochran's Q test was employed to evaluate discrepancies in estimates among different subgroups, with the heterogeneity index quantified using both the Cochran Q test and I² values [23]. Levels of heterogeneity were classified as low, moderate, and high, corresponding to I² values of 25%, 50%, and 75%, respectively [24]. Subgroup analysis, allowed us to examine the prevalence of hepatitis C in Somalia across various factors, including year of publication, study design type, and population demographics. Descriptive statistics were used to briefly characterize the data, with findings considered statistically significant at a P<0.001 [23].

The methodological quality of the included studies was rigorously assessed using the Joanna Briggs Institute (JBI) critical assessment standards for prevalence data. This evaluation yielded a comprehensive quality score ranging from 0 to 18, with scores of 14 to 18 indicating satisfactory quality.

Results

Study Selection Process

Our study involved a meticulous search across five electronic databases, yielding a total of 4,823 records. After removing duplicate articles, 1,516 unique records underwent screening based on their titles and abstracts. Of these, 1,257 articles were excluded based on predefined exclusion criteria. Subsequently, all remaining articles underwent thorough assessment for suitability.

An additional 244 studies were excluded due to duplicate data, insufficient information regarding HCV infection in Somalia, or unclear reporting of prevalence figures. Ultimately, 15 publications met the inclusion criteria for qualitative synthesis and meta-analysis. Figure 1 provides a comprehensive overview of our study selection process.

Characteristic of the included studies

The prevalence of the Hepatitis C Virus (HCV) in Somalia has been investigated through various studies, as summarized in Table 1. Table 1 presents a characteristic overview of included studies, detailing important parameters such as authorship, publication year, study country, total sample size, number of positive cases detected, and study design. Interestingly, the studies use both retrospective and cross-sectional designs, which illustrates the variety of methodological approaches used to determine the incidence of HCV in Somalia throughout varying time periods. Of the total included research (n = 9), cross-sectional studies comprise almost 60% of the studies. Studies range from earlier works in the 1990s to recent publications in 2023, indicating a longitudinal exploration of HCV prevalence trends. Approximately 47% of the included studies were published within the last decade (n = 7).

There were three method of HCV detection in the included studies (ELISA, PCR and PCR/Elisa), ELISA was the major detection method used in the study account for approximately 53% (n=8) of the entire included studies.

Studies vary significantly in sample size, from smaller cohorts of 42 participants to largerscale investigations involving over 67,000 individuals. This diversity in sample sizes allows for a nuanced assessment of prevalence across different population segments and geographical regions within Somalia.

The number of positive HCV cases reported varies across studies, with smaller studies detecting as few as one positive case, whereas larger-scale investigations identify over a thousand positive cases.

Subgroup Meta-Analysis on the Epidemiology of HCV in Somalia

The subgroup meta-analysis in Table 3 offers a comprehensive analysis of the prevalence of Hepatitis C Virus (HCV) in Somalia. It includes a detailed breakdown based on study design, technique of detection, and year of publication. This study provides a thorough analysis of how these variables impact the reported rates of HCV prevalence, highlighting substantial variation among different researchers. The analysis comprises two main study designs: cross-sectional and retrospective. There has been a total of nine crosssectional studies conducted, which have found that the prevalence of HCV is 4.7%. The confidence interval for this estimate is from 2.3% to 9.4%, as shown in figure 4. The level of diversity among these studies is exceptionally high, as demonstrated by an I² value of 91.5% and a Q statistic of 94.08, both of which are statistically significant (p < 0.001), as shown in Table 3.

On the contrary, six retrospective investigations indicate a lower incidence of 2.3% (ranging from 1.0% to 4.9%), as shown in Figure 4. In this group, the heterogeneity is particularly noticeable, with an I² value of 98.4% and a Q statistic of 313.36, which is also statistically significant (p < 0.001). The results emphasize the significant variations in the reported prevalence of HCV in retrospective investigations, indicating heterogeneity in the populations studied, research methods, or other relevant aspects.

Between 2000 and 2010, three studies showed a prevalence rate of 3.6% (ranging from 1.6% to 7.8%) (Figure 5). The level of variation among the studies was rather low, with an I² value of 36.49%, a Q value of 3.15, and a p-value of 0.207. From 2011 to 2020, two investigations showed a significant rise in prevalence to 14.4% (with a range of 7.5% to 25.7%). This increase was accompanied by a substantial level of variation ($I^2 = 78.89\%$, Q =4.74, p = 0.030). The large increase can be due to heightened awareness and enhanced detection procedures throughout this period. During the period from 2021 to 2024, as indicated by five studies, the prevalence decreased to 1.3% (ranging from 0.7% to 2.4%). The data showed a significant level of heterogeneity ($I^2 = 95.69\%$, Q = 118.80, p < 0.001). This decline may be attributed to maybe due

to the short period of studies included and improved prevention and control strategies, as well as breakthroughs in public health treatments, as indicated in Table 3.

The technique used for detecting HCV is of great importance in determining the reported prevalence rates. Eight studies utilizing Enzyme-Linked Immunosorbent Assay (ELISA) as the sole method indicate a prevalence rate of 3.7% (ranging from 1.7% to 7.9%) (Figure 6). These studies also show significant heterogeneity ($I^2 = 98.62\%$, Q = 507.51, p < 0.001). The presence of significant heterogeneity highlights the intrinsic variability observed in research that utilizes this detection approach. On the other hand, research using both Polymerase Chain Reaction (PCR) and ELISA (3 studies) indicates a lower occurrence rate of 2.2% (with a range of 1.6% to 3.1%) (Figure 5). The level of heterogeneity in this case is considerably lower, as indicated by an I² value of 77.05% and a Q statistic of 1.96. These values suggest a more uniform and consistent set of data (p = 0.375). Combining PCR with ELISA may enhance the accuracy of estimating HCV prevalence. Four investigations utilizing PCR alone found a prevalence of 4.4% (ranging from 1.7% to 11.1%), with a moderate level of heterogeneity (I² value not reported, Q = 13.07, p = 0.004). The occurrence of HCV also differs between various publishing eras. Prior to 2000, there were 5 studies published that reported a prevalence rate of 5.0% (ranging from 1.7% to 13.8%), with a significant level of variation $(I^2 = 95.69\%, Q = 92.71, p < 0.001)$. The prevalence estimates over this period vary significantly, perhaps because of advancements in diagnostic procedures and shifts in epidemiological trends, as indicated in Table 3.

S/N	Name of Author	Year of	Country	Total	Positive	study design	Method of
		publication			case		detection
1	Kadle et al[25]	2012	Somalia	156	30	cross-	ELISA
						sectional	
2	Khadjio et al[26]	2011	Somalia	147	15	cross-	ELISA
						sectional	
3	Nur et al[27]	2000	Somalia	256	6	cross-	PCR/ELISA
						sectional	
4	Watts et al[14]	1994	Somalia	438	8	retrospective	PCR
5	Aceti et al[8]	1993	Somalia	885	35	retrospective	ELISA
6	Bile et al[28]	1993	Somalia	124	29	retrospective	ELISA
7	Bile et al (a)[29]	1992	Somalia	596	9	cross-	PCR/ELISA
						sectional	
8	Bile et al (b)[29]	1992	Somalia	96	9	cross-	PCR
						sectional	
9	Jeele et al[16]	2021	Somalia	320	7	cross-	ELISA
						sectional	
10	Groen et al[27]	2000	Somalia	57	4	cross-	PCR
						sectional	
11	Groen et al (a)[27]	2000	Somalia	42	1	cross-	PCR
						sectional	
12	Hassan-Kadle et al[30]	2023	Somalia	7791	33	retrospective	ELISA
13	Uglu et al[31]	2023	Somalia	9405	82	retrospective	ELISA
14	Oznur[32]	2021	Somalia	67,749	1278	retrospective	ELISA
15	UCAROĞLU and	2023	Somalia	720	19	cross-	PCR/ELISA
	ADAN[33]					sectional	

Table 1. Characteristic table of the included studies on the prevalence of HCV in Somalia

Pooled prevalence of HCV in Somalia

Table 2 provides a comprehensive evaluation of the included studies' quality; according to JBI standards, all of the included studies were of excellent quality.

Table 2. Quality of included studies by JBI critical appraisal checklist for studies reporting prevalence data JBI CHECKLIST*

S/N	Name of authors and year of publication		JBI checklist*									Total
			1	2	3	4	5	6	7	8	9	
1	Kadle et al[25]	2012	Yes	No	Yes	16						
2	Khadjio et al[26]	2011	Yes	No	Yes	16						
3	Nur et al[27]	2000	Yes	No	Yes	16						
4	Watts et al[14]	1994	Yes	No	Yes	16						
5	Aceti et al[8]	1993	Yes	No	Yes	16						
6	Bile et al[28]	1993	Yes	No	Yes	16						
7	Bile et al (a)[29]	1992	Yes	No	Yes	16						
8	Bile et al (b)[29]	1992	Yes	No	Yes	16						

Variable	Number of studies	Prevalence (%)	Confidence Internet (%)	Q	I2 (%)	Heterogeneity	
	5.00005	(,,,,)				DF	Р
Study design							
Cross-sectional	9	4.7	2.3 - 9.4	94.08	91.5	8	< 0.001
Retrospective	6	2.3	1.0 - 4.9	313.36	98.4	5	< 0.001
Method of							
Detection							
ELISA	8	3.7	1.7 - 7.9	507.51	98.62	7	< 0.001
PCR/ELISA	3	2.2	1.6 - 3.1	1.96	77.05	2	0.375
PCR	4	4.4	1.7 - 11.1	13.07		3	0.004
Year of Publication							
<2000	5	5.0	1.7 – 13.8	92.71	95.69	4	< 0.001
2000 - 2010	3	3.6	1.6 - 7.8	3.15	36.49	2	0.207
2011 - 2020	2	14.4	7.5 - 25.7	4.74	78.89	1	0.030
2021 - 2024	5	1.3	0.7 - 2.4	118.80	95.69	4	< 0.001

Table 3: Subgroup meta-analysis of the epidemiology of HCV in Somalia in relation to study design, Method of detection and year of publication

Figure 1. Summary of the studies selection and screening process.







Figure 3. A funnel plot showing no publication bias on the prevalence of HCV in Somalia



Egger's P = 0.10289



Figure 4. Subgroup forest plot of the type of study designs on the epidemiology of HCV in Somalia

Figure 5. Subgroup forest plot of the year of publication on the epidemiology of HCV in Somalia







DISCUSSION

This study demonstrates that the incidence of HCV is still significant, with a moderate pooled prevalence of 3.5% (CI: 2.0% - 5.9%), despite reports of decreased HCV prevalence in Somalia. The moderate prevalence of HCV in Somalia may be due to factors such as underreporting, insufficient detection and diagnostic tools, and inadequate facilities [11,34]. The rather common occurrence of HCV in Somalia aligns with reports from other countries in sub-Saharan Africa [35,36]. Unlike prior research that generally concentrated on certain locations or subpopulations inside Somalia [14,15,37], our method involved a thorough exploration of five electronic databases. The initial acquisition of 4,823 records by this extensive net indicates a wider range of data compared to studies with a narrower emphasis. Our study attempted to reduce biases by using a diverse range of sources, resulting in a comprehensive perspective on the incidence of HCV throughout the country. The predetermined exclusion rigorous criteria implemented in our study resulted in the exclusion of 1,257 papers, guaranteeing that only the most pertinent studies were incorporated. This level of rigor is in opposition to the methods employed by Hanafiah et al., who achieved a greater rate of inclusion but may have compromised the specificity of their findings by incorporating research with more general or less strict criteria [38]. Our methodology focused on selecting a smaller number of papers for the final analysis, however, we gave priority to the quality and relevance of data specifically related to HCV infection in Somalia.

The Somali studies exhibit a wide range of including methodological techniques, crosssectional and retrospective designs. Similar approaches are widely used in global HCV research, as well as in studies undertaken in nearby countries such as Ethiopia and Kenya [39,40]. Nevertheless, the percentage of cross-sectional studies conducted in Somalia (60%) is comparatively greater, indicating a tendency to focus on obtaining current prevalence snapshots in the Somali setting. In contrast to certain areas, where longitudinal studies are less frequent, they still offer useful insights regarding the incidence of HCV and the effects of therapies over time [41].

The rising number of research studies conducted on the incidence of HCV in Somalia in the last ten years is similar to the global pattern, where increased awareness and better diagnostic methods have stimulated research efforts. For instance, nations with significant Hepatitis C Virus (HCV) loads, including Egypt and Pakistan, have experienced a notable increase in research studies in recent years [42,43]. In the Somali setting, there has been a similar trend, with 47% of studies published in the last ten years. This highlights a worldwide change towards giving more importance to HCV research.

The prevalence of ELISA as the main detection technique in Somali investigations (53%) aligns with international norms, especially in areas with limited resources where ELISA's costefficiency and ease of use make it the favored option [38,44]. On the other hand, countries or regions with higher income and better healthcare infrastructure, like Western Europe and North America, prefer to use PCR more extensively because it is more sensitive and specific [45]. The rising incorporation of PCR in Somali studies reflects a wider inclination towards embracing more sophisticated diagnostic techniques to enhance the accuracy of prevalence assessment.

The diverse prevalence of positive HCV cases documented in research conducted in Somalia, ranging from isolated instances in smaller studies to thousands in bigger ones, mirrors a comparable trend observed in other geographical areas. For example, research conducted in both rural and urban regions of Vietnam, Malaysia and China [46–48] demonstrates similar levels of variation, suggesting that the prevalence of HCV is affected by factors such as population density, access to healthcare, and socio-economic situations. The diversity in research on Somalia highlights the importance of interpreting findings in a way that is relevant to the local environment. This is equally important in other regions afflicted by HCV.

The significant variation observed in our analysis of cross-sectional studies ($I^2 = 91.5\%$, Q =94.08, p < 0.001) and retrospective studies ($I^2 =$ 98.4%, Q = 313.36, p < 0.001) underscores a critical challenge in understanding the epidemiology of Hepatitis C Virus (HCV). These high I² values indicate that a large proportion of the variability in study results is not due to random chance, but rather reflects genuine differences in the data collected across various studies. This aligns with findings from other regions, particularly sub-Saharan Africa, where a thorough examination of HCV incidence revealed substantial diversity in reported rates and epidemiological characteristics. In the context of HCV, this variation can be attributed to multiple factors. Firstly, the demographic characteristics of study populations such as age, sex, and risk factors—can differ markedly from one study to another. For instance, populations with higher prevalence rates may include specific high-risk groups that are not present in other studies, thus skewing results.

Secondly, methodological differences play a significant role. Studies may employ different diagnostic criteria, sampling techniques, and data collection methods, which can lead to discrepancies in reported incidence rates. Some studies might focus on high-risk populations, while others might include broader community samples, leading to variability in findings.

Additionally, the healthcare infrastructure and socioeconomic conditions in different regions can influence both the prevalence of HCV and the detection of cases. Limited access to healthcare services and variability in screening practices can result in underreporting or misreporting of HCV cases, further complicating the landscape of epidemiological data.

The consistency of high I² values across numerous subgroup analyses (often exceeding 90%) serves as a clear indication of these challenges. It emphasizes the need for standardized methodologies and more comprehensive demographic considerations in future research. Without addressing these variances, drawing definitive conclusions about HCV incidence remains difficult, potentially hindering effective public health strategies and interventions aimed at controlling and reducing the burden of HCV [11].

The temporal patterns revealed in our analysis, with fluctuating prevalence rates throughout different periods, correspond to global trends in HCV epidemiology. From 2000 to 2010, the prevalence rate remained reasonably consistent at 3.6%. This could be attributed to the worldwide initiatives aimed at improving diagnostic accuracy and research methodology throughout that time. Similarly, a study conducted by Gower et al. observed more uniformity in the estimation of HCV prevalence in the early 2000s, attributing this improvement to the utilization of more advanced diagnostic instruments and surveillance systems [50]. The substantial rise in the prevalence of HCV to 14.4% during the period from 2011 to 2020 in our data can be ascribed to increased awareness and improved detection techniques. A similar trend was observed in other studies, including one carried out in Egypt, where intensified screening efforts resulted in higher reported prevalence rates throughout a comparable time frame [42]. The decrease in prevalence to 1.3% from 2021 to 2024 may be attributed to the implementation of more effective prevention and control strategies, like the patterns observed in countries that have widely adopted antiviral treatments and public health interventions [11].

The choice of detection techniques had a substantial impact on the prevalence rates reported in our investigation. The studies that used ELISA alone showed a higher level of heterogeneity compared to the studies that used both PCR and ELISA. Consistent prevalence estimates were generally obtained by combining serological and molecular approaches, which aligns with the findings of prior meta-analyses [51]. The observed heterogeneity in PCR-only investigations (Q = 13.07, p = 0.004) could be attributed to variations in the sensitivity and specificity of the PCR method. This difficulty has previously been acknowledged in other countries with a wide range of HCV genotypes [52].

The incidence rates documented in research published before 2000 exhibit substantial variation, which can be ascribed to the development of diagnostic methods and shifting epidemiological patterns. This aligns with the past difficulties in diagnosing HCV and the steady enhancement in detection techniques over the years [53].

Limitation of study

The strength of this systematic review and meta-analysis included a high number of searched manuscripts adding robustness and diversity to the study. Fifteen high-quality publications were selected using rigorous screening and inclusion criteria, reducing bias and improving reliability. The study included diverse research designs. Crosssectional and retrospective designs gave a comprehensive view of HCV incidence in Somalia, while the 1990s–2023 temporal coverage allowed for informative trend analysis. The complexity of the meta-analysis adds robustness to the study. The JBI criteria guaranteed that only high-quality papers were included, bolstering the conclusions. Though the study has strengths, the heterogeneity of included studies with I² values over 90% in several subgroup analyses hampers the interpretation of pooled prevalence estimates due to study population and methodology discrepancies. Publication bias, where non-significant research is underrepresented, may affect prevalence estimates. Therefore, care should be taken in the interpretation of the result as it might not be the best representation of the entire pooled prevalence. The small number of recent research (from 2021 to 2024) may not fully capture current prevalence trends, and language and regional biases may eliminate significant studies published in other languages or not indexed in the selected databases.

Conclusion

The epidemiology of hepatitis C virus in Somalia is moderately high (3.5%) and of epidemiological significance and stress the need for an effective routine checkup, adequate awareness and surveillance scheme in Somalia.

Supplementary Materials

B1: Search strategy of anemia prevalence in Somalia.

Author Contributions

ASAM and KEB. Conceived and designed the study. Methodology: KEB, ASAM, and YAN select and assess the quality of studies. KEB and ASAM extracted and analyzed data. Analysis and writing: ASAM and KEB interpreted the results and drafted the manuscript. Writing review and editing: KEB, ASAM, and YAN reviewed and edited the manuscript. All authors have read and agreed to the published version of the manuscript.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

The data presented in this study are available in the supplementary material.

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Conflicts of Interest

The authors declare no conflict of interest.

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