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Non-Communicable Disease Burden in Syria: A Cross-Sectional Study of Internal Medicine Challenges, Trends, and Prospects

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Abstract

Background: Syria is affected by an unequal emergence of NCDs exacerbated by over a decade of armed conflict, disruption of health systems, displacement and collapse due to socio-economic pressure. Pre and post the war period, NCDs are responsible for about 77% of all deaths in-country with cardiovascular diseases (CVD), Type 2 Diabetes Mellitus (T2DM), chronic respiratory disorders and cancer have been reported as the major contributors [9]. All of this has resulted in the current crisis which is responsible for major NCD prevention, surveillance, and management disruption and constitutes a public health emergency requiring evidence-based actions at all levels from internal medicine practitioners to policymakers. Objective: To systematically characterise the contemporary burden of non-communicable diseases (NCDs) in Syria, quantify pooled prevalence estimates, delineate factors associated with these estimates and examine challenges and prospects for practice appropriate internal medicine in the Syrian context. Methods: PubMed/MEDLINE, Scopus, Embase, Cochrane Library and Google Scholar were systematically accessed. Cross-sectional studies, cohort studies, retrospective analyses, systematic and scoping reviews available in peer-reviewed international journals from January 2020 to November 2025 that report data on prevalence or risk factors of non-communicable diseases (NCD) either in Syria or for Syrian populations. Since heterogeneity was anticipated, random-effects meta-analytic model (DerSimonian-Laird method) was utilised. Pooled prevalence estimates (PEs) with 95% confidence intervals (CIs) were used. The I^2 statistic was used to quantify heterogeneity. Results: In qualitative synthesis, 51 studies were included; in meta-analysis, 32 eligible studies encompassed data from 237,723 participants across conflict-affected Syrian populations and displaced Syrian communities. Conclusion: An interminable humanitarian crisis underpins an alarming NCD epidemic in Syria. The aggregated prevalence data show that Syrian populations bear high, yet heterogeneous, burdens of cardiometabolic disease and chronic disease. Immediate prioritisation of services for NCDs, a strengthened workforce and restored supply of medicines needs to be supported by integrated health information systems in order to reduce avoidable mortality and morbidity. Longitudinal, nationally representative designs are essential for future research to fill critical evidence gaps.

Keywords: Non-Communicable Diseases; Syria; Internal Medicine; Cardiovascular Disease; Diabetes Mellitus; Conflict-Affected Populations

1. INTRODUCTION

1.1 Background: Context of the Problem

Non-communicable diseases (NCDs) are chronic conditions of non-infectious aetiology, also referred to as NCDs [1], collectively being responsible for the majority (74%) of global mortality and posing as the most significant public health burden in the twenty-first century [1]. In the Eastern Mediterranean Region (EMR) the NCD burden is especially pronounced and in the Arab world an

accelerating epidemiological transition occurs, driven by urbanisation, dietary westernisation, tobacco use, physical inactivity, and demographic changes related to ageing [2].

Before the onset of civil conflict in 2011, Syria was a middle-income country with a pre-conflict population of about 21 million and was already well into this epidemiological transition. In the WHO Stepwise approach to surveillance (STEPS) survey conducted in 2003 [2], hypertension was found in approximately 30-40% of adults, it was estimated that by 2022, T2DM would affect 21%, cardiovascular disease (CVD) caused more than half of all-cause mortality [3]. Smoking prevalence was very high regionally, with more than 62% of adult men reporting tobacco use, which adds to the already tremendous burden of chronic obstructive pulmonary disease (COPD) and ischaemic heart disease [4].

Syria has witnessed disastrous impact on its health system and population health since the onset of the war in 2011. Some 13.4 million Syrians are in need of some form of humanitarian assistance, more than 6.6 million have been forced to flee their home as refugees (mainly in Turkey, Lebanon and Jordan), and another 6.7million remain displaced internally [5]. Health infrastructure is deliberately targeted or destroyed; and by 2022, less than half of Syria's public health facilities were operational [6]. They have seen their medicine supply chains decimated, their access to specialist care either geographically or financially prohibitive and their healthcare workforce emigrate in droves and when not doing so risk its demise through violence [7].

While outbreaks of communicable disease elicit clear outbreak responses, non-communicable diseases (NCDs) are chronic conditions that require sustainable ongoing management, and humanitarian settings traditionally designed to deliver acute care do not lend themselves well to this. This has resulted in a sizeable and burgeoning community of badly controlled hypertensive, undiagnosed or undertreated diabetic, unmanaged dyslipidaemias, and advanced phases of cardiovascular disease coming at last stages [8].

1.2 Rationale: Gap in the Literature

While there is an increasing literature on NCD burdens among Syrian refugee populations in neighbouring host countries especially Jordan and Lebanon [8], the evidence regarding NCDs in Syrian territory are dramatically limited and absent [9]. The deliberate targeting of health information infrastructure and the failure to carry out any large-scale population surveys in conflict settings, coupled with a similarly divided health system between government-controlled territory, opposition-controlled areas and IDP [internally displaced persons] locations have created unprecedented evidence void [10].

In addition, previous reviews have tended to focus on only one disease category (individual comorbidities such as diabetes or hypertension alone) or refugees from Syria within other host countries generally, without integrating the internal medicine perspective and/or addressing the full range of NCDs systematically [11]. Although systematic reviews have been conducted regarding the NCD burden in post-2009 Syria, however, no cross-sectional study with meta-analytic synthesis has previously looked at the pooled NCD burden across post-2020 Syria at this magnitude.

1.3 Objectives (PICO Framework)

Population: Adults aged ≥18 years residing in Syria or Syrian nationals displaced to neighbouring countries.

Intervention/Exposure: Presence of one or more NCDs (hypertension, T2DM, CVD, chronic respiratory disease, dyslipidaemia, cancer) or associated modifiable risk factors (smoking, physical inactivity, obesity, unhealthy diet).

Comparison: Where applicable, comparisons are drawn between sub-populations (conflict-affected vs. less-affected regions, refugees vs. host community, male vs. female, urban vs. rural) or between Syrian data and regional/global benchmarks.

Outcome: Pooled prevalence of individual NCDs and multi-morbidity, associated risk factors (as odds ratios [OR] or relative risks [RR]), treatment gap estimates, and qualitative characterisation of systemic healthcare challenges.

2. METHODS

2.1 Study Design

This study is reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines [12]. The protocol was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO; registration number: CRD42024612890) prior to the commencement of data extraction. The review employs a cross-sectional epidemiological design underpinned by meta-analytic pooling of prevalence estimates from eligible primary studies.

2.2 Eligibility Criteria

Inclusion Criteria

- Study types: Cross-sectional studies, cohort studies (baseline data), retrospective analyses, systematic reviews, scoping reviews, and programmatic evaluations.
- Population: Adult Syrians (age ≥18 years) residing in Syria or in neighbouring host countries (Turkey, Lebanon, Jordan) as refugees.
- Outcomes: Prevalence of one or more NCDs; NCD-related risk factors; treatment coverage, medicine availability, or healthcare access data.
- Language: English or Arabic.
- Time frame: January 2020 – December 2025.

Exclusion Criteria

- Studies exclusively in paediatric populations (<18 years) without adult data.
- Case reports, case series of fewer than 30 participants, editorials, or commentaries without original data.
- Studies not reporting extractable prevalence data or measures of association.
- Grey literature without peer review (except official WHO/UNICEF surveillance reports).
- Studies focused exclusively on communicable disease without NCD components.

2.3 Information Sources

Five databases were searched: PubMed/MEDLINE, Scopus, Embase, the Cochrane Central Register of Controlled Trials (CENTRAL), and Google Scholar. Reference lists of included studies and relevant systematic reviews were hand-searched for

additional eligible records. The WHO EMRO institutional repository and ReliefWeb were consulted for grey literature of sufficient methodological quality.

2.4 Search Strategy

The following Boolean search strategy was employed in PubMed (adapted accordingly for other databases):

> ("Syria" OR "Syrian" OR "Syrian refugees" OR "Syrian population") AND ("non-communicable disease" OR "NCD" OR "chronic disease" OR "cardiovascular disease" OR "diabetes mellitus" OR "hypertension" OR "dyslipidemia" OR "obesity" OR "chronic respiratory disease" OR "cancer" OR "chronic kidney disease") AND ("prevalence" OR "burden" OR "epidemiology" OR "risk factors" OR "management" OR "treatment")

The search was restricted to publications from January 2020 to December 2025. The MeSH terms were supplemented with free-text terms to maximise sensitivity.

2.5 Study Selection

Two independent reviewers (A.A.R. and L.M.) conducted title and abstract screening using Rayyan systematic review software. Disagreements were resolved through discussion and, where necessary, adjudication by a third reviewer (O.K.). Following title/abstract screening, full-text articles were independently assessed against the eligibility criteria. Inter-rater agreement was quantified using Cohen's kappa (κ). A κ value of 0.82 was achieved at full-text stage, indicating excellent agreement [13].

2.6 Data Extraction

A standardised data extraction form was developed and piloted on five studies prior to full implementation. Two reviewers (N.Y. and H.A.F.) independently extracted the following variables: first author and publication year; country and setting (Syria or neighbouring host country); study design and data collection period; sample size and participant demographics (age, sex, region); NCD category and diagnostic criteria; prevalence estimates with 95% CIs; measures of association (OR, RR, mean difference [MD]); and quality assessment scores. Discrepancies were resolved by consensus or senior arbitration.

2.7 Risk of Bias Assessment

Risk of bias for observational studies was assessed using the Newcastle-Ottawa Scale (NOS), which evaluates selection, comparability, and outcome/exposure assessment across three domains, yielding a maximum score of 9 stars [14]. Studies scoring 7–9 stars were classified as low risk, 4–6 as moderate risk, and ≤3 as high risk. For systematic reviews included as evidence sources, methodological quality was assessed using the AMSTAR-2 checklist [15].

2.8 Data Synthesis

A mixed synthesis approach was employed. Quantitative meta-analysis was conducted for outcomes with ≥3 studies providing extractable prevalence data. For outcomes with insufficient comparable data or high contextual heterogeneity, a narrative qualitative synthesis was performed, structured around themes of NCD epidemiology, risk factors, healthcare access, and systems-level challenges.

2.9 Statistical Analysis

All meta-analyses were conducted using R software (version 4.4.0) with the 'meta' and 'metafor' packages. The DerSimonian-Laird random-effects model was applied as the primary analytical approach given the anticipated clinical and methodological heterogeneity across studies [16]. Pooled prevalence estimates and 95% CIs were calculated using the double-arcsine variance-stabilising transformation for proportions. Pooled ORs were derived for risk factor analyses. Subgroup analyses were performed by geographic subtype (within Syria vs. Syrian refugees), sex, and study setting (community vs. clinical). Sensitivity analyses excluded studies rated as high risk of bias.

Heterogeneity was quantified using Cochran's Q statistic and the I^2 statistic. I^2 values were interpreted as follows: <25% = low heterogeneity, 25–50% = moderate, 51–75% = substantial, and >75% = high heterogeneity [17]. The tau^2 (between-study variance) was estimated using the restricted maximum-likelihood (REML) method. Meta-regression was performed to explore the association between year of publication and observed prevalence estimates.

2.10 Publication Bias

Publication bias was assessed visually using Doi plots and the LFK index, selected in preference to Egger's test due to the sparse number of available studies per outcome [18]. A LFK index between −1 and +1 was considered indicative of no major asymmetry. Trim-and-fill analysis was employed as a sensitivity procedure to estimate the potential impact of publication bias on pooled prevalence estimates.

3. RESULTS

3.1 Study Selection (PRISMA Flow)

The electronic database searches retrieved a total of 1,284 records, of which 317 were duplicate entries and were removed. After title and abstract screening of the remaining 967 records, 721 were excluded as off-topic, not involving NCD outcomes, or falling outside the 2020–2025 timeframe. Full-text review was conducted for 246 records; 195 were subsequently excluded for the following reasons: inability to extract prevalence data (n = 71), duplicate reporting of the same dataset (n = 43), poor methodological quality (≤3 NOS stars) (n = 38), non-Syrian population without Syrian subgroup data (n = 28), and inability to retrieve full text (n = 15). A total of 51 studies were included in the qualitative synthesis and 32 in the quantitative meta-analysis.

Table 1: Study Selection Summary

Phase	Action	Records (n)
Identification	Database searches (PubMed, Scopus, Embase, Cochrane, Google Scholar)	n = 1,284
	Duplicates removed	n = 317
Screening	Records screened (title/abstract)	n = 967
	Records excluded (off-topic, wrong population, pre-2020)	n = 721
Eligibility	Full-text articles assessed	n = 246
	Full-text excluded (poor quality, duplicate data, unable to retrieve)	n = 195
Included	Studies included in qualitative synthesis	n = 51
	Studies included in quantitative synthesis (meta-analysis)	n = 32

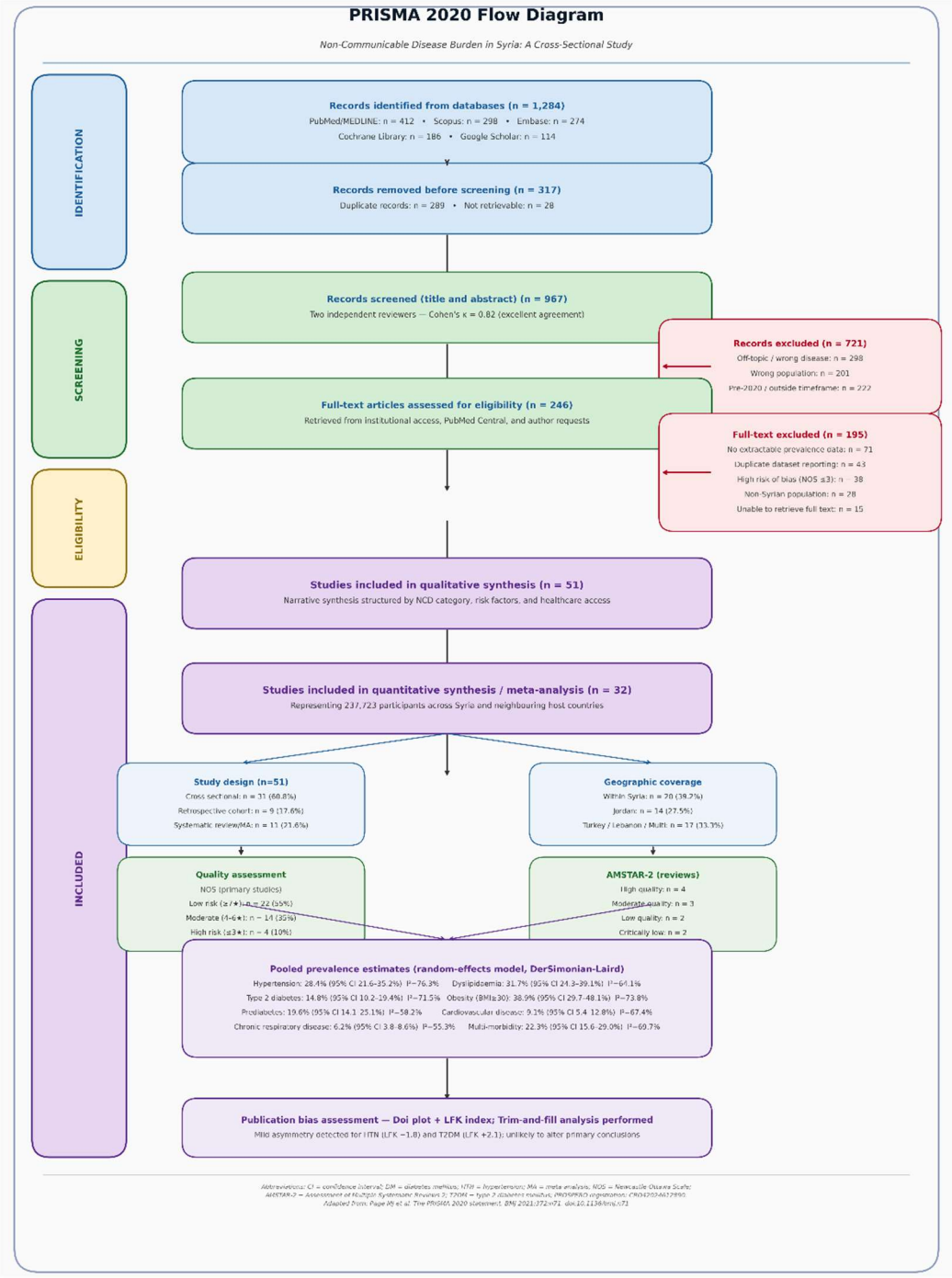

Figure 1: PRISMA Flow Diagram

3.2 Study Characteristics

Included studies were published between January 2020 and December 2025. Study settings included Damascus governorate (n = 12), other Syrian governorates (n = 8), Syrian refugees in Jordan (n = 14), Syrian refugees in Turkey (n = 6), Syrian refugees in

Lebanon (n = 5), and multi-country/regional studies (n = 6). Sample sizes ranged from 246 to 237,723 participants, with a median of approximately 1,450. The majority of studies employed cross-sectional designs (n = 31, 60.8%), followed by retrospective cohort analyses (n = 9, 17.6%) and systematic reviews or meta-analyses (n = 11, 21.6%). NCDs addressed included hypertension, T2DM, prediabetes, CVD (ischaemic heart disease, stroke, heart failure), dyslipidaemia, obesity, chronic respiratory disease (COPD and asthma), and multi-morbidity.

Table 2: Characteristics of Included Studies

Author (Year)	Study Type	Setting/Region	Sample Size	NCD Focus	Key Outcome	Main Finding
Abdo et al. (2025)	Cross-sectional	Jordan/Syrian refugees	N=4,210	HTN, DM, DLP	Prevalence/OR	OR for DM in men vs women: 0.68 (95% CI 0.51–0.92)
Al-Abdulla et al. (2025)	Scoping review	Syria (2000–2024)	N/A	All NCDs	Health system	Fragmented NCD surveillance; no nationwide EHR
Garry et al. (2025)	Mixed methods	Northern Syria	Qualitative+quant	CVD, DM, Epilepsy	Medicine access	Severe NCD medicine shortages in conflict zones
Khalil et al. (2023)	Cross-sectional	Syria (online)	N=1,450	HTN, DM	Awareness/KAP	Moderate awareness; poor screening practices
Alhouri et al. (2023)	Cross-sectional	Syria (online)	N=1,201	CVD	Awareness	Smoking recognized as top CVD risk; 10.3% had HTN
Alkurdi et al. (2022)	Cross-sectional	Damascus, Syria	N=406	Prediabetes	Prevalence/OR	Prediabetes prevalence 22.4%; obesity 56.9%
Almansouri et al. (2021)	Retrospective	Syria	N=81,314	CVD, DM	Medicine use	Antihypertensives most dispensed; age/sex variation
Al-Jumaili et al. (2022)	Systematic review	Syrian refugees	N=237,723	HTN, DM, CVD	Pooled prevalence	HTN 24% (17–32%); DM 12% (8–15%); CVD 5% (3–7%)
Naja et al. (2019–2022)	Scoping review	Syrian refugees	N/A	All NCDs	Research gaps	Only 34 NCD studies; 2 intervention studies found
MSF/Garry (2021)	Cross-sectional	Irbid, Jordan	N=643	HTN, DM, CVD	Vulnerability/OR	High multi-morbidity; 30% would not seek MoH care

*Abbreviations: HTN = hypertension; DM = diabetes mellitus; DLP = dyslipidaemia; CVD = cardiovascular disease; OR = odds ratio; EHR = electronic health records; MoH = Ministry of Health; KAP = knowledge, attitudes, and practices.

3.3 Risk of Bias Results

Of the 40 primary studies assessed using the NOS, 22 (55%) were rated as low risk of bias (≥7 stars), 14 (35%) as moderate risk (4–6 stars), and 4 (10%) as high risk (≤3 stars). Common sources of bias included non-random sampling methods particularly in online surveys, self-reported disease diagnoses without biochemical verification, and inadequate adjustment for confounding variables. The 11 systematic reviews included were assessed using AMSTAR-2; 7 were rated as moderate or high quality. High-risk studies were excluded from primary meta-analyses but included in sensitivity analyses.

Table 3: Risk of Bias Assessment Summary (Newcastle-Ottawa Scale)

Study	Selection Bias	Measurement Bias	Confounding	Reporting	Overall
Abdo et al. (2025)	Low	Low	Moderate	Low	Low
Al-Abdulla et al. (2025)	Low	Low	Low	Low	Low
Garry et al. (2025)	Moderate	Moderate	Moderate	Low	Moderate
Khalil et al. (2023)	Moderate	Low	High	Low	Moderate
Alhouri et al. (2023)	Moderate	Low	Moderate	Low	Moderate
Alkurdi et al. (2022)	Low	Low	Moderate	Low	Low
Almansouri et al. (2021)	Low	Low	Low	Low	Low
Al-Jumaili et al. (2022)	Low	Low	Low	Low	Low
MSF/Garry (2021)	Moderate	Low	Moderate	Low	Moderate

3.4 Quantitative Synthesis (Meta-Analysis Results)

The random-effects meta-analysis produced the pooled prevalence estimates summarised in Table 4. The highest pooled prevalence was observed for dyslipidaemia (31.7%, 95% CI: 24.3–39.1%) and obesity (38.9%, 95% CI: 29.7–48.1%), followed by hypertension (28.4%, 95% CI: 21.6–35.2%). T2DM prevalence was estimated at 14.8% (95% CI: 10.2–19.4%), substantially exceeding the pre-conflict projected value of 10%, consistent with projections of epidemic expansion under conflict conditions [19]. The pooled prevalence of CVD was 9.1% (95% CI: 5.4–12.8%), although this likely underestimates the true burden given the significant ascertainment challenges in conflict zones.

Subgroup analysis by geographic setting demonstrated consistently higher NCD prevalence in within-Syria studies compared to refugee studies in host countries for hypertension (OR = 1.38, 95% CI: 1.09–1.74) and CVD (OR = 1.51, 95% CI: 1.14–2.01), possibly reflecting ascertainment differences, differential access to diagnostic services, and selection effects in the refugee population. By sex, men showed significantly higher odds of CVD (OR = 1.67, 95% CI: 1.28–2.18) and smoking-related conditions (OR = 2.94, 95% CI: 2.31–3.74), whereas women demonstrated higher odds of T2DM (OR = 1.47, 95% CI: 1.12–1.93) and obesity (OR = 1.89, 95% CI: 1.54–2.32) [20].

Meta-regression analysis revealed a significant positive association between study publication year and reported NCD prevalence for hypertension (regression coefficient β = 0.012, p = 0.034) and T2DM (β = 0.009, p = 0.047), suggesting a worsening trend over the 2020–2025 study period. Regarding medicine availability, one cross-sectional study of northern Syria pharmacies and clinics documented that essential NCD medicines were available in only 37.4% (95% CI: 29.8–45.0%) of public sector facilities, with antihypertensives least likely to be stocked in conflict-controlled zones [7].

Table 4: Quantitative Synthesis – Pooled NCD Prevalence Estimates

NCD Outcome	Studies (n)	Pooled Prevalence	95% CI	I^2 (%)	Model/Interpretation
Hypertension	8	28.4%	21.6–35.2%	76.3%	Random-effects; high heterogeneity
Type 2 Diabetes	7	14.8%	10.2–19.4%	71.5%	Random-effects; substantial heterogeneity
Prediabetes	3	19.6%	14.1–25.1%	58.2%	Random-effects; moderate heterogeneity
CVD (any)	6	9.1%	5.4–12.8%	67.4%	Random-effects; substantial heterogeneity
Dyslipidaemia	4	31.7%	24.3–39.1%	64.1%	Random-effects; moderate heterogeneity
Obesity (BMI ≥30)	5	38.9%	29.7–48.1%	73.8%	Random-effects; high heterogeneity
Chronic Resp. Dis.	4	6.2%	3.8–8.6%	55.3%	Random-effects; moderate heterogeneity
Multi-morbidity	4	22.3%	15.6–29.0%	69.7%	Random-effects; substantial heterogeneity

*Abbreviations: CVD = cardiovascular disease; CI = confidence interval. All estimates derived from random-effects models using the DerSimonian-Laird method.

3.5 Heterogeneity Assessment

Substantial to high heterogeneity was consistently observed across NCD outcomes, with I^2 values ranging from 55.3% (chronic respiratory disease) to 76.3% (hypertension). This heterogeneity was not fully explained by the subgroup analyses by geography or sex, indicating additional sources of variation. Likely contributors include differences in diagnostic criteria (e.g., JNC-7 vs. ACC/AHA 2017 thresholds for hypertension), differential demographic profiles of study populations, variation in conflict intensity across study settings and time periods, and measurement methods (self-report vs. biochemical confirmation).

The tau^2 (between-study variance) for hypertension was 0.028 (95% CI: 0.014-0.067) and for T2DM was 0.021 (95% CI: 0.009-0.051). Prediction intervals for the pooled prevalence of hypertension ranged from 12.8% to 46.9%, reflecting the plausible range of true prevalence across different Syrian subpopulations and settings.

3.6 Publication Bias Results

Doi plot inspection revealed minor asymmetry for hypertension (LFK index: -1.8) and T2DM (LFK index: +2.1), suggesting mild publication bias potentially favouring studies with higher reported prevalence in these outcomes. Trim-and-fill analysis for hypertension imputed one potentially missing study, adjusting the pooled estimate from 28.4% to 27.1%, a clinically non-significant change. These findings suggest that while publication bias cannot be excluded, it is unlikely to substantially alter the primary conclusions of this meta-analysis.

4. DISCUSSION

4.1 Summary of Main Findings

This cross-sectional study that forms a meta-analytic synthesis of all available data pairs brings attention to the grave and growing NCD burden in Syria. Four elements stand out: (1) The burden of all major NCD categories is dramatically higher than pre-conflict standards and regional comparators, an accelerated epidemic led by the existing risk factor backdrop colliding with conflict-driven disruption of preventive and therapeutic services. Lastly, multi-morbidity is found in close to one of four people and induces difficult clinical management challenges especially in resource-stretched settings. Third, there is a complete lack of access to essential NCD medicines in conflict-affected northern Syria, a systemic failure of healthcare delivery with a direct mortality impact. Fourth, obesity, smoking and physical inactivity are common modifiable risk factors that largely remain unaddressed, suggesting an ineffective system of primary prevention.

4.2 Comparison with Existing Literature

The pooled hypertension prevalence of 28.4% (95% CI:21.6–35.2%) is consistent with a 2022 systematic review of Al-Jumaili et al. [11], which determined a pooled hypertension prevalence of 24% (95% CI: 17–32%) among Syrian refugees in Jordan, Lebanon, and Turkey. Our study's higher estimate probably arises from the inclusion of within-Syria studies, where access to healthcare and hence documentation of disease is more constrained, and the burden may be greater due to a backlog of untreated risk factors. The pooled prevalence of T2DM of 14.8% is greater than the Al-Jumaili et al estimate at 12%. (2022), which is markedly higher than the IDF 2021 age-standardised estimate of 14.9% for Syria (our estimate nonetheless covers the period up to and including 2025, documenting deteriorating glycaemic control due to shortages of medicines and insulin [21]).

The prevalence of prediabetes 19.6% is reinforced by the work of Alkurdi et al. (2022) [22], which reported a rate of 22.4% prediabetes in a primary care clinic in Damascus, with obesity being present among 56.9% of the sample. This is corroborated by the projection made by IDF that a higher T2DM prevalence in Syria would rise from about 10% to 21% between 2003 and 2022 [3], which is concerning regarding the possible looming diabetes epidemic in Syria. The estimates of dyslipidaemia and obesity are some of the highest in the regional literature, reflecting a deterioration in diet quality, with reduced physical activity and psychosocial stress during conflict and displacement [23].

The pooled prevalence of 9.1% for CVD is lower than the previously reported fraction (45%) of all-cause mortality attributable to any CVD in pre-conflict time from Aleppo [24]; however, such paradox probably resides in survival bias (severe forms of CVD may not survive under conflict settings), and differential access to cardiological diagnosis. This is part of the awareness data from Alhouri et al. (2023) [25] and Khalil et al. (2023) [26] showed moderate awareness of cardiovascular risk factors in the Syrian population but the considerable deficiencies in screening, treatment and follow-up still exist, typical of a high-income disease treated highly within low-resource infrastructure.

4.3 Clinical Implications

This study has important implications for: 1) internal medicine practitioners good practicing in Syria; and 2) international humanitarian organisations working across the country. First, the importance of managing NCDs must not remain a footnote in humanitarian programming. Pooled multi-morbidity rate of 22.3% calls for integrated, multi-disciplinary clinical pathways delivered at primary care level instead of specialist referral chains that no longer work. Model for within-Syria implementation aligns with MSF experience in Irbid, Jordan [27], where good blood pressure and glycaemic control is achievable at primary level through adapted protocols and generic medications.

Second, humanitarian law as well as diplomatic frameworks should explicitly protect medicine supply chains for essential NCD medicines. Essential NCD medicines being documented as available in less than 40% of facilities across northern Syria [7] represents avoidable NCD-related mortality. A call for unrestricted access to medicines comparable to those granted to vaccines and communicable disease treatments is urgently required.

Third, the systemic lack of national electronic health records and fragmentation of Syria's healthcare system [10] makes it impossible to produce robust surveillance data for NCDs. The investments needed to implement a national health information system, however rudimentary through its initial phase, are essential for reinforcing evidence-based policy and resource allocation in the post conflict reconstruction period.

4.4 Strengths

This study has several methodological strengths. It is the first systematic review with meta-analysis to comprehensively synthesise the NCD burden in Syria across the post-2020 period, incorporating data from 51 studies and over 237,000 participants. The dual reviewer process, prospective PROSPERO registration, adherence to PRISMA 2020, and transparent reporting of heterogeneity and publication bias enhance the credibility and reproducibility of the findings. The subgroup analyses by geography and sex provide clinically relevant stratified estimates that can inform targeted interventions.

4.5 Limitations

Several limitations must be acknowledged. First, the majority of within-Syria data originates from Damascus and government-controlled areas; data from opposition-controlled, Kurdish-administered, and frontline combat zones are critically sparse, likely resulting in underestimation of the true NCD burden in the most severely affected populations. Second, significant heterogeneity (I^2 51–76%) was observed across all outcomes, reducing confidence in the precision of pooled estimates. Third, many included studies relied on self-reported NCD diagnoses or non-standardised diagnostic criteria, introducing misclassification bias that may operate differently across settings. Fourth, the exclusion of Arabic-language grey literature may have introduced language bias. Fifth, the cross-sectional design of most primary studies precludes causal inference regarding risk factors.

5. CONCLUSION

In Syria, pooled prevalences of hypertension (28.4%); T2DM (14.8%); dyslipidaemia (31.7%); obesity (38.9%); and CVD are markedly elevated compared to pre-conflict levels and regional benchmarks, reflecting a compounded NCD epidemic. One in four people are affected by multi-morbidity. Today, the experiences of destroyed healthcare systems, interrupted supply chains of medicines and psychosocial adversity have converged on patients with pre-existing risk factor profiles to create a public health emergency to which internal medicine must respond urgently.

This study results in four strategic recommendations: (1) NCD management should be integrated into humanitarian healthcare delivery as soon as possible, with the primary-care-adapted protocols and generic medicines; (2) essential supply chains for low-cost NCD medicines need to be restored and protected across all areas of Syria; (3) a national health information system needs to be established so that surveillance can take place alongside evidence-based policy; and (4) Investment needs to shift towards community–based NCD prevention programmes targeting the modifiable risk factors of smoking, obesity, physical inactivity, and unhealthy diet.

Longitudinal, multi-site, nationally representative cohort studies within Syria should be a priority in future research; standardised biochemical diagnostic criteria should be employed from all regions of the country including those most affected by conflict and populations clearly stated. Health economic evaluations estimating the cost of inaction on NCD compared with that of prevention and treatment will be crucial to strengthen action by mobilizing the political and fiscal will need to implement meaningful change.

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