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Burden of metabolic dysfunction-associated steatotic liver disease in the Asia-Pacific region from 1990 to 2023

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ABSTRACT

Background Metabolic dysfunction-associated steatotic liver disease (MASLD) is an increasing health problem in the Asia-Pacific region, contributing significantly to morbidity and healthcare burden. This study provides a comprehensive analysis of the burden of MASLD across countries and territories in the Asia-Pacific region from 1990 to 2023.

Methods We used the Global Burden of Disease 2023 data set to assess the burden of MASLD in the Asia-Pacific region, calculating age-standardised prevalence, incidence, death and disability-adjusted life year (DALY) rates. Temporal trends, age-specific and sex-specific patterns, and the relationship between MASLD burden and Socio-demographic Index (SDI) were also analysed, along with regional variations driven by ageing, population growth and epidemiological changes.

Results In 2023, MASLD prevalence varied across the Asia-Pacific region, with the highest rates in Oceania (15 360.55 per 100 000), Central Asia (15 201.10 per 100 000), South-East Asia (15 116.91 per 100 000) and East Asia (15 042.06 per 100 000), and lower rates in Australasia (9336.02 per 100 000) and high-income regions (8654.71 per 100 000). Over the past three decades, MASLD prevalence has increased across all regions, with the largest growth in Australasia (29%) and East Asia (27%). In addition, marked regional disparities were observed in age-standardised death and DALY rates, with Central Asia exhibiting the highest health loss across the region. Age-stratified analyses revealed that the highest incidence occurred in individuals aged 20–24 years in 2023. MASLD burden followed an inverse U-shaped pattern with SDI, increasing in regions with lower SDI and decreasing in those above 0.62. Population growth and lifestyle changes were the primary drivers of MASLD in East Asia, while ageing significantly contributed to the rising burden in South Asia.

Conclusions MASLD is increasingly prevalent across the Asia-Pacific region, driven by ageing, population growth and epidemiological changes, with significant regional variations in the disease burden.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Metabolic dysfunction-associated steatotic liver disease (MASLD) is increasingly recognised as a major public health concern worldwide, particularly in the Asia-Pacific region where rapid urbanisation, economic development and rising metabolic risk factors have accelerated disease prevalence.
⇒ However, comprehensive and comparable estimates of MASLD burden across Asia-Pacific countries and subregions remain limited.

WHAT THIS STUDY ADDS

⇒ Using Global Burden of Disease 2023 data, this study demonstrates a sustained increase in MASLD burden across Asia-Pacific countries, with marked subregional heterogeneity.
⇒ The analysis also reveals a shift towards younger age groups and identifies an inverse U-shaped relationship between MASLD burden and the Socio-demographic Index.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings highlight the need for region-specific prevention and control strategies tailored to diverse demographic and socioeconomic contexts across the Asia-Pacific region.
⇒ Policymakers should prioritise early detection, metabolic risk factor control and targeted public health interventions to mitigate the growing MASLD burden.

INTRODUCTION

Metabolic dysfunction-associated steatotic liver disease (MASLD) has emerged as one of the most prevalent chronic liver diseases in the Asia-Pacific region, closely paralleling the rapid increases in obesity and type 2 diabetes across high-income and developing countries.[1–4] MASLD imposes a substantial and growing public health burden, not only due to its potential progression to advanced liver disease, but also because of its strong associations with cardiovascular, renal and metabolic complications.[5–8] These systemic cardiometabolic consequences reinforce MASLD as a

multisystem metabolic disorder, emphasising its extensive impact on population health and healthcare systems across this diverse region.[9–13]

The Asia-Pacific region presents a uniquely heterogeneous landscape for MASLD epidemiology.[14 15] It encompasses high-income, ageing countries such as Japan and the Republic of Korea, as well as low-income and middle-income countries experiencing rapid urbanisation and lifestyle transitions, such as India, Vietnam and the Philippines.[16] These differences manifest in distinct disease patterns: high-income countries face a gradually increasing burden due to chronic metabolic conditions in older populations, whereas low-income and middle-income countries experience rapidly rising incidence rates of MASLD among younger adults.[17] Notably, the rising prevalence of paediatric MASLD also adds a new dimension to the disease burden, with childhood obesity and early onset metabolic dysfunction contributing to MASLD development in both children and adolescents.[18] Dietary habits, physical activity and cultural factors further modulate disease onset, progression and severity across all age groups.[19 20] Access to healthcare and diagnostic resources varies widely, affecting early detection, disease management and ultimately, population-level outcomes. Despite this diversity, comprehensive and comparable epidemiological data across the Asia-Pacific region remain scarce. Most studies are hospital-based or limited to specific populations, and methodologies can vary widely, which limits cross-country comparisons and obscures temporal trends. Consequently, the full spectrum of MASLD burden, particularly its interaction with age, sex and socioeconomic development, remains incompletely understood.

To address these gaps, this study uses the latest Global Burden of Disease (GBD) 2023 data set to provide a comprehensive assessment of MASLD burden in the Asia-Pacific region. By quantifying the prevalence and incidence rates across countries, age groups, sexes and socioeconomic levels, we aimed to identify populations at highest risk and to highlight regional variations that may inform policy and healthcare planning. These findings aim to support targeted prevention strategies, guide the allocation of healthcare resources and provide evidence for region-specific interventions to mitigate the growing health and economic impact of MASLD worldwide.

METHODS

Data sources

This study used data from the GBD 2023 Study to assess the burden of MASLD in the Asia-Pacific region. The GBD 2023 framework integrates multiple sources, including national vital registration systems, population-based health surveys, hospital and outpatient records, disease registries and published scientific studies.[21–23] All data undergo rigorous quality control, bias adjustment and statistical modelling using standardised GBD methodologies to ensure comparability across countries and over time. For confidentiality, no personally identifiable information was used, and as the study relied entirely on de-identified, publicly available data, ethical approval and informed consent were not required.

MASLD-related data for all countries and territories in the Asia-Pacific region were extracted from the Global Health Data Exchange through the online GBD Results Tool (https://vizhub.healthdata.org/gbd-results/). Data were obtained from the independently listed cause category 'Total burden related to Non-alcoholic fatty liver disease (NAFLD)'. The query parameters were set as follows: measure (prevalence, incidence, deaths and disability-adjusted life years (DALYs)), metric (number and age-standardised rate), sex (both sexes), age (all age groups), year (1990–2023) and location (all countries and territories within the Asia-Pacific region). Age-standardised rates were based on the GBD world standard population. The primary outcomes were the prevalence and incidence rates, reported as both absolute counts and age-standardised rates in 2023. The GBD modelling framework incorporates demographic and epidemiological variables and uses sophisticated statistical techniques to estimate disease burden even in regions with limited data.[24 25]

Definitions in the GBD 2023 data set

MASLD, as reported in this study, corresponds to the NAFLD cause category from GBD 2023. Although the estimates are derived from NAFLD nomenclature rather than the newly proposed MASLD definition, the overlap exceeds 95%, allowing these data to be interpreted under the MASLD terminology.[26] GBD 2023 defines NAFLD cases based on a combination of data sources, including population-based surveys, hospital and outpatient records, disease registries and available biomarkers or diagnostic codes. Viral hepatitis, alcohol-related liver disease and other secondary causes were excluded according to standard GBD definitions. Burden estimates were generated using the DisMod-MR Version 2.1 meta-regression framework, which integrates multiple data sources while accounting for missing information, sampling variability and measurement uncertainty. This modelling approach produces internally consistent estimates of prevalence and incidence, allowing meaningful comparisons across countries and over time. The Asia-Pacific region, as defined by the GBD framework, encompasses diverse countries and territories. For this study, the region is divided into Central Asia, Australasia, high-income Asia Pacific, South Asia, East Asia, Oceania and South-East Asia. These subregions are categorised based on geographical proximity, socioeconomic development and healthcare infrastructure, facilitating detailed analysis of MASLD burden across heterogeneous settings.

The Socio-demographic Index (SDI) is a composite measure used to explore the relationship between socioeconomic development and MASLD burden in different subregions of the Asia-Pacific region. SDI incorporates three key indicators: the total fertility rate among women

under 25, mean years of education for individuals aged 15 years and older, and per capita income (adjusted for temporal changes). SDI values range from zero (low socioeconomic development) to 1 (high socioeconomic development), offering insights into how socioeconomic factors can influence the prevalence and incidence rates of MASLD. By incorporating SDI values into the analysis, we aimed to gain a deeper understanding of how public health policies, healthcare infrastructure and socioeconomic development may interact to shape disease patterns across different regions.

Statistical analysis

All analyses were conducted using the GBD 2023 summary estimates for the countries in the Asia-Pacific region. The primary outcomes of interest were age-standardised prevalence, incidence, death and DALY rates calculated using the world standard population as reported in the GBD Study 2023, along with corresponding per cent changes and supplemented by 95% uncertainty intervals (UIs). The 95% UIs were derived from the 2.5th and 97.5th percentiles of 1000 posterior samples. UIs reflect both sampling variability from input data and model-based uncertainty from extrapolation. Temporal trends were assessed by calculating the average annual percentage change in age-standardised prevalence rates. Trends were categorised as increasing, decreasing or stable, based on the 95% UIs. A non-overlapping UI with zero was considered statistically significant, indicating a meaningful association between the variables. We also examined age-specific and sex-specific patterns, including in paediatric populations, to identify any differences in early onset MASLD. Age-standardised prevalence and incidence rates were computed separately for men and women to explore sex-based differences in MASLD burden. Regional and country-level variations were analysed by comparing age-standardised prevalence and incidence rates, as well as absolute counts, across the different subregions of the Asia-Pacific region. These regional comparisons help capture geographical heterogeneity in MASLD burden and assess disparities in the disease burden that may arise from socioeconomic development, healthcare access and lifestyle factors.

To understand the influence of socioeconomic development on the burden of MASLD, we evaluated the relationship between the SDI and disease burden across regions. The association between SDI and MASLD burden was formally assessed using Spearman's rank correlation analysis. Finally, the MASLD burden was decomposed into contributions from ageing, population growth and epidemiological changes using a decomposition method.[27 28] To estimate the influence of these factors on MASLD trends, we employed a method that decomposes the overall trend into its key drivers. We isolated the effect of ageing by examining how shifts in the population's age structure influenced MASLD, assuming that older populations may have higher disease rates. The impact of population growth was separated by considering how the overall increase in population size, independent of age, contributed to higher disease numbers. Finally, epidemiological changes were assessed by analysing how disease rates within specific age groups have evolved over time, excluding the effects of ageing and population growth. The Bayesian approach also facilitated the estimation of uncertainty around each factor's contribution, ensuring a robust and nuanced understanding of the trends.

RESULTS

Burden and temporal trends of MASLD in the Asia-Pacific region

At the 2023 time point, the age-standardised prevalence rates of MASLD varied substantially across regions in the Asia-Pacific and neighbouring areas (online supplemental table 1). The highest age-standardised prevalence rates were observed in Oceania (15 360.55 per 100 000; 95% UI 14 067.59 to 17 081.05), Central Asia (15 201.10 per 100 000; 95% UI 13 857.36 to 16 840.77), South-East Asia (15 116.91 per 100 000; 95% UI 13 795.09 to 16 758.44) and East Asia (15 042.06 per 100 000; 95% UI 13 771.89 to 16 656.31). South Asia (12 793.28 per 100 000; 95% UI 11 650.81 to 14 227.30) showed intermediate levels, while lower rates were noted in Australasia (9336.02 per 100 000; 95% UI 8560.62 to 10 289.41) and the high-income Asia Pacific region (8654.71 per 100 000; 95% UI 7924.92 to 9593.89). A similar geographical distribution was observed for the age-standardised incidence rate, ranging from 346.64 per 100 000 (95% UI 318.60 to 377.40) in the high-income Asia Pacific region to 613.74 per 100 000 (95% UI 561.47 to 665.04) in South-East Asia in 2023. The overall upward trend indicates a continuing rise in MASLD burden across the Asia-Pacific region from 1990 to 2023 (figure 1 and online supplemental figure 1). From 1990 to 2023, the age-standardised prevalence rate increased in all regions, with total percentage changes ranging from 11% in Oceania to 29% in Australasia and 27% in East Asia.

In 2023, the age-standardised death and DALY rates attributable to MASLD remained substantial across the Asia-Pacific region (online supplemental table 1). Central Asia demonstrated the highest death rate at 3.34 per 100 000 (95% UI 2.44 to 4.34) and the highest DALY rate at 88.53 per 100 000 (95% UI 64.49 to 117.02), indicating a disproportionate concentration of advanced disease and health loss. South-East Asia and Australasia exhibited intermediate levels, with death rates of 1.56 (95% UI 1.15 to 2.00) and 1.56 per 100 000 (95% UI 1.28 to 1.90), respectively, and DALY rates of 43.61 (95% UI 33.13 to 55.86) and 42.17 per 100 000 (95% UI 33.73 to 51.20). In contrast, high-income Asia Pacific, East Asia and South Asia showed comparatively lower death and DALY burdens, with death rates of 0.94 (95% UI 0.73 to 1.18), 0.64 per 100 000 (95% UI 0.52 to 0.79) and 0.57 per 100 000 (95% UI 0.37 to 0.88), and DALY rates of 20.62 (95% UI 16.32 to 25.83), 16.26 per 100 000 (95% UI 13.48 to 19.83) and 15.98 per 100 000 (95% UI 10.69 to 24.11).

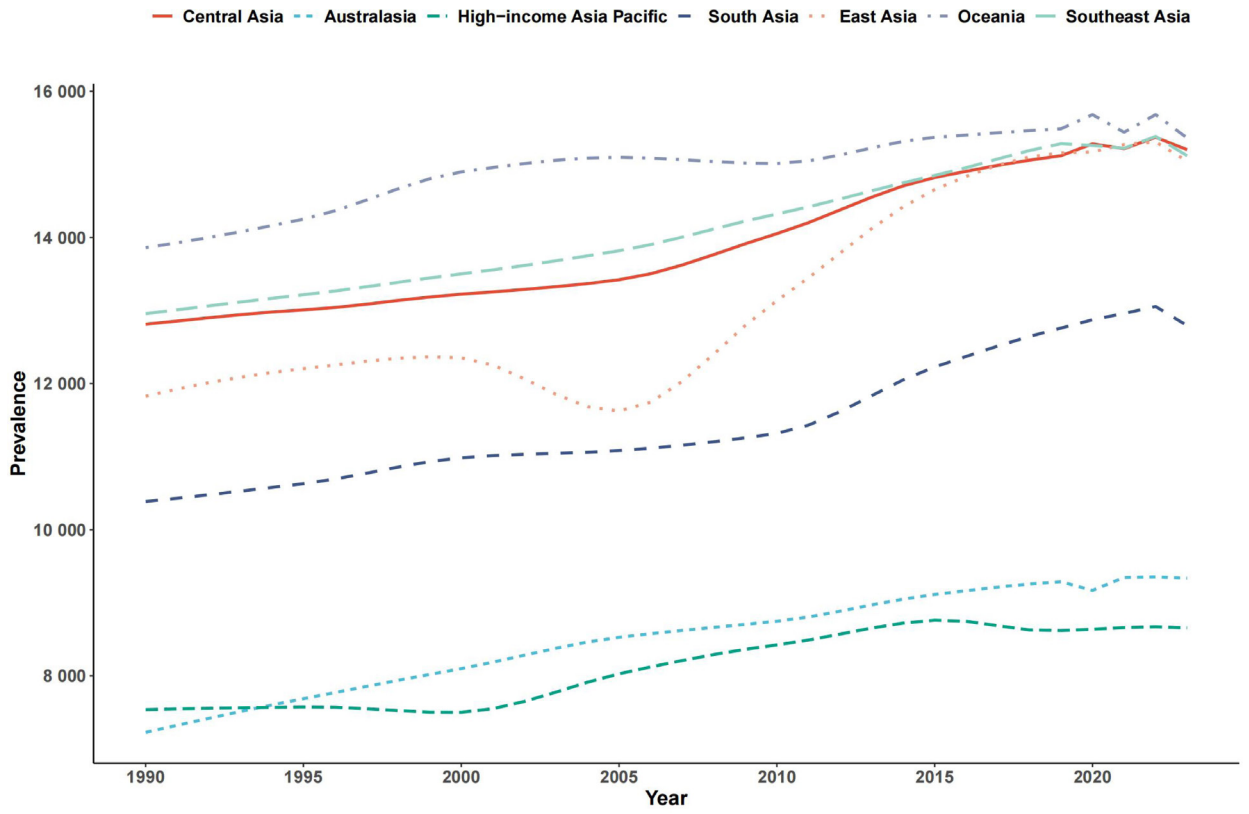

Figure 1 Temporal trends of age-standardised prevalence of MASLD (cases per 100 000 persons) in the Asia-Pacific region from 1990 to 2023. MASLD, metabolic dysfunction-associated steatotic liver disease.

National-level MASLD burden and temporal trends in the Asia-Pacific region

At the national level, the age-standardised prevalence of MASLD varied substantially across countries in the Asia-Pacific region in 2023 (online supplemental table 1). Among countries in Central Asia, prevalence ranged from 12 694.85 per 100 000 in Mongolia (95% UI 11 585.39 to 14 085.02) to 16 605.34 per 100 000 in Azerbaijan (95% UI 15 086.23 to 18 410.08). High-income Asia Pacific countries generally exhibited lower prevalence rates, with Japan reporting 7839.84 per 100 000 (95% UI 7193.63 to 8698.90) and the Republic of Korea reporting 9902.62 per 100 000 (95% UI 9014.98 to 10 990.29). South-East Asian nations showed moderate prevalence, ranging from 11 397.10 per 100 000 in the Lao People's Democratic Republic (95% UI 10 397.74 to 12 654.15) to 19 658.34 per 100 000 in Malaysia (95% UI 17 836.15 to 21 710.54). Oceania countries generally had the highest burden, with Palau at 19 341.09 per 100 000 (95% UI 17 622.56 to 21 292.22) and American Samoa at 22 917.89 per 100 000 (95% UI 20 904.44 to 25 040.20). The age-standardised incidence rates mirrored prevalence patterns, ranging from 319.95 per 100 000 in Japan (95% UI 294.08 to 347.71) to 800.20 per 100 000 in Fiji (95% UI 739.98 to 865.12). Central Asian and South Asian countries exhibited intermediate incidence rates, typically ranging from 494.46 to 658.26 per 100 000. In contrast, countries in Oceania consistently reported higher incidence rates, often exceeding 600 per 100 000. Temporal trends from 1990 to 2023 revealed substantial increases in age-standardised prevalence across most countries. The total percentage change ranged from 7% in Mongolia to 30% in Australia, Bhutan and Nepal, indicating generally slow but consistent growth in MASLD prevalence over the three-decade period. Overall, these data suggest that while the prevalence and incidence rates of MASLD vary considerably across countries, the upward trend is nearly universal across the Asia-Pacific region.

At the national level, age-standardised death and DALY rates attributable to MASLD in 2023 also demonstrated notable variation across countries (online supplemental table 1). Overall, age-standardised death rates ranged from around 0.46 to over 7.08 per 100 000, while DALY rates spanned from approximately 9.37 to nearly 184.85 per 100 000, indicating substantial health loss beyond prevalence and incidence alone. For example, relatively lower death rates were observed in Singapore (0.46 per 100 000; 95% UI 0.33 to 0.63) and China (0.63 per 100 000; 95% UI 0.51 to 0.77), whereas higher rates occurred in Mongolia (7.08 per 100 000; 95% UI 5.02 to 9.87) and Turkmenistan (5.70 per 100 000; 95% UI 4.03 to 7.96). Similarly, DALY burdens were lower in countries such as Singapore (9.37 per 100 000; 95% UI 7.06 to 12.24) and China (15.88 per 100 000; 95% UI 13.11 to 19.25), and higher in Turkmenistan (184.85 per 100 000; 95% UI 127.75 to 259.02), Mongolia (160.95 per 100 000; 95% UI 118.41 to 214.57) and Tonga (125.94 per 100 000; 95%

UI 85.07 to 177.30), reflecting the broad spectrum of MASLD-related health loss at the national level.

Sex-stratified and age-stratified burden in the Asia-Pacific region

In the Asia-Pacific region, the prevalence and incidence of MASLD exhibit significant gender-related and age-related variations, with notable differences across subregions and age groups (online supplemental figure 2). Across nearly all age groups, the prevalence of MASLD is generally higher in men than in women, with a more pronounced disparity observed in Australasia and the high-income Asia Pacific regions. In contrast, in East Asia and South-East Asia, the gender differences in prevalence are relatively small. As age increases, the prevalence of MASLD rises gradually for both men and women. Regarding incidence, a notable trend is that younger populations (under 40 years) exhibit relatively higher rates across most regions, with the highest incidence observed in the 20–24 years age group across all regions. In some areas, particularly in Australasia and the high-income Asia Pacific regions, the incidence among younger men is significantly higher than that of women. As individuals age, the incidence of MASLD generally declines. However, a distinct increase in incidence is observed around the 50–60 years age range, particularly among women. This trend is most pronounced in regions such as East Asia, Oceania and South-East Asia, where the incidence among women may even exceed that of men in these age groups. Age-standardised death and DALY burdens also exhibit pronounced sex-related and age-related gradients across the Asia-Pacific, with women generally experiencing higher death and DALY rates than men, and these disparities become progressively more marked with advancing age (online supplemental figure 3). Importantly, the magnitude of these sex differences varies across subregions, such that higher-burden settings (eg, Central Asia and South-East Asia) demonstrate larger absolute gaps between male and female death and DALY rates, whereas lower-burden settings (eg, Australasia and Oceania) show relatively attenuated male–female differentials in these health loss measures.

Relationship between SDI and MASLD burden

A non-linear pattern suggestive of an 'inverse U-shaped' distribution was descriptively observed between prevalence and SDI in the Asia-Pacific region. In lower SDI regions (0.40–0.62), prevalence increases as SDI rises (figure 2). Once SDI exceeds 0.62, prevalence decreases. Oceania peaks at an SDI of 0.49 (approximately 16 000 per 100 000), with a significant decline thereafter. East Asia and South-East Asia exhibit peaks around SDI 0.65–0.75, with East Asia having lower prevalence. South Asia shows lower prevalence levels, with a gradual increase as SDI rises, indicating regional variation. A similar non-linear pattern was descriptively observed for incidence across the region. In lower SDI regions (0.40–0.62), incidence increases with rising SDI, likely due to urbanisation and lifestyle changes (online supplemental figure 4). Once SDI surpasses 0.62, incidence decreases. Oceania exhibits peak incidence at an SDI of 0.49 (approximately 580 per 100 000), followed by a decline. Both East Asia and South-East Asia show peaks around SDI 0.65–0.75, with East Asia reporting lower values. South Asia exhibits lower incidence rates with minimal fluctuation, indicating distinct socioeconomic dynamics within the region.

Drivers of MASLD prevalence and incidence in the Asia-Pacific region

The contributors to the MASLD burden in the Asia-Pacific reveal heterogeneous contributions from ageing, population growth and epidemiological changes (figure 3). For MASLD prevalence, East Asia has the highest burden, mainly driven by population growth and epidemiological

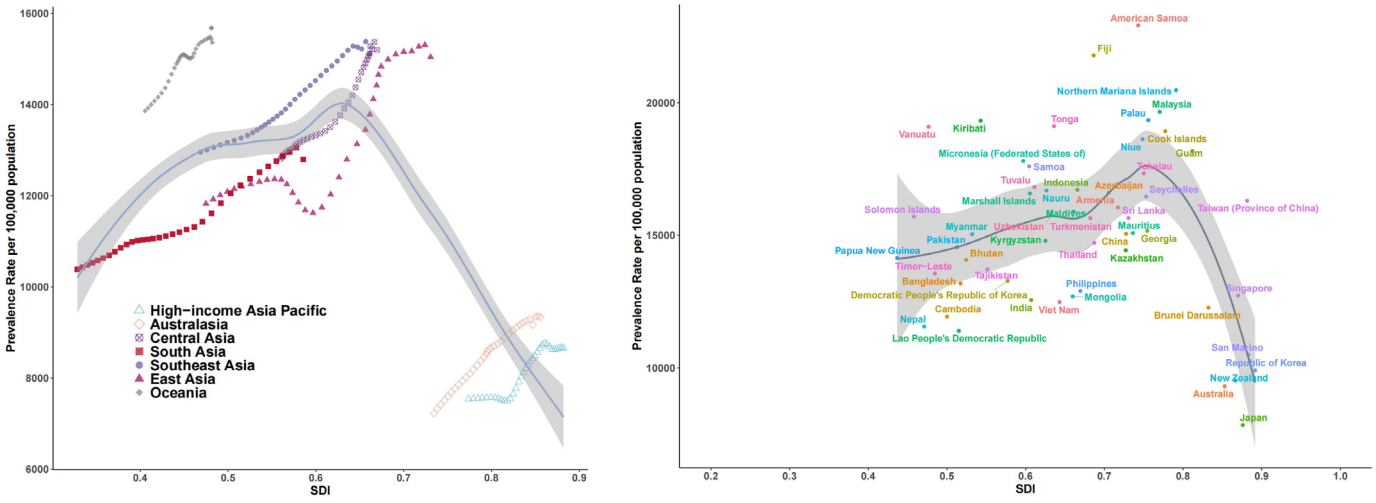

Figure 2 (A) Relationship between age-standardised prevalence of MASLD (cases per 100 000 persons) and SDI in the Asia-Pacific region from 1990 to 2023; (B) Relationship between age-standardised prevalence of MASLD (cases per 100 000 persons) and SDI by country and territory in the Asia-Pacific region in 2023. MASLD, metabolic dysfunction-associated steatotic liver disease; SDI, Socio-demographic Index.

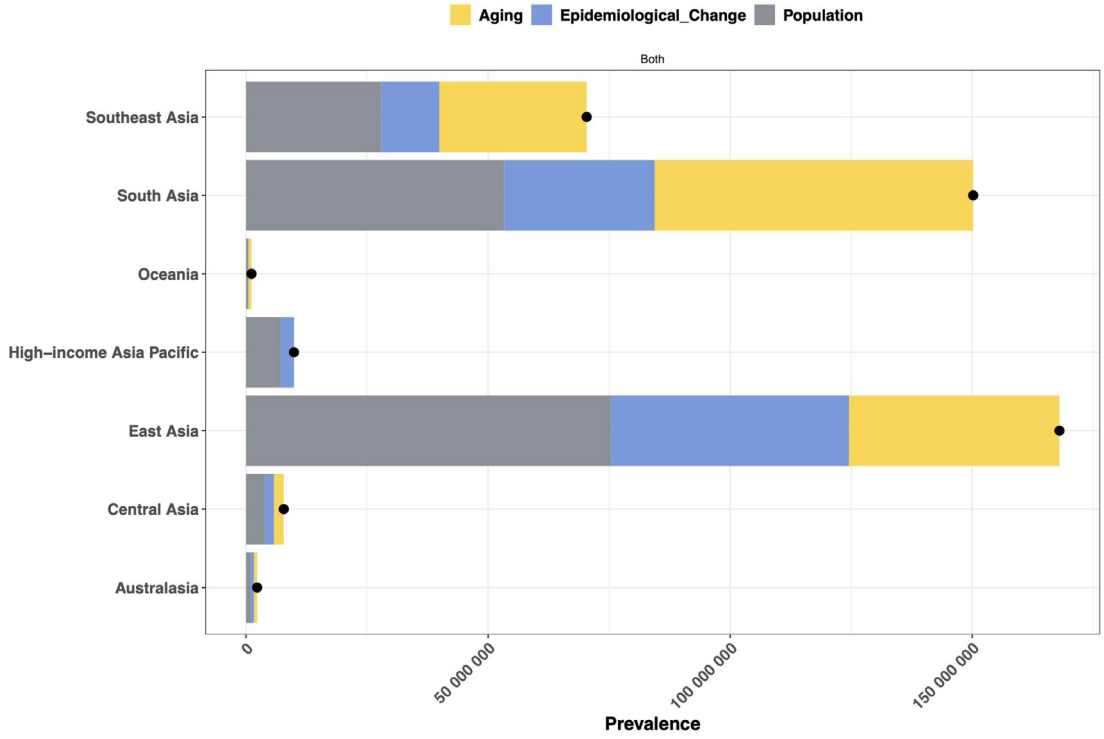

Figure 3 Decomposition of age-standardised prevalence of MASLD (cases per 100 000 persons) in the Asia-Pacific region: contributions of ageing, population growth and epidemiological changes in 2023. MASLD, metabolic dysfunction-associated steatotic liver disease.

shifts, while ageing contributes less. South Asia follows, with ageing as the dominant driver. South-East Asia shows intermediate prevalence, with ageing and population growth contributing more significantly than epidemiological changes. High-income Asia Pacific, Australasia, Central Asia and Oceania exhibit lower prevalence, with modest contributions from all factors. Country-level patterns align with these trends: Japan and the Republic of Korea show lower prevalence in high-income Asia Pacific, whereas Palau and American Samoa in Oceania have higher prevalence.

Incidence rates of MASLD showed a similar pattern. South Asia has the highest incidence, driven by population growth and ageing (online supplemental figure 5). East Asia follows, with population growth and epidemiological changes contributing. South-East Asia exhibits an intermediate incidence, with relatively balanced contributions. High-income Asia Pacific, Australasia, Central Asia and Oceania maintain lower incidence with minimal influence from any single factor. Country-specific examples include China and Taiwan (province of China) in East Asia, where the incidence is elevated due to a combination of demographic and epidemiological factors, and Fiji and the Marshall Islands in Oceania, where population and epidemiological factors contribute to a high incidence. These results underscore the multifactorial and region-specific nature of MASLD burden across the Asia-Pacific region.

DISCUSSION

Using the latest GBD 2023 data set, this study shows a significant increase in the prevalence and incidence rates of MASLD, accompanied by substantial regional disparities in death and DALY-related health loss, across the Asia-Pacific region over the past three decades, with consistent rises in South Asia and Central Asia, where population growth and ageing are key drivers of this trend. In contrast, high-income countries in the Asia-Pacific region exhibit more stable trends, likely due to their robust healthcare systems and effective preventive strategies. The results also highlight regional heterogeneity, with Oceania, Central Asia, South-East Asia and East Asia experiencing the highest burden of MASLD. Age-stratified analyses further reveal that the highest incidence occurs in individuals aged 20–24 years. Collectively, the study highlights the need for region-specific interventions to address the growing burden of MASLD over the past three decades, particularly in emerging economies where population growth and ageing are significant contributing factors to the disease.

Our first key finding indicates considerable heterogeneity in MASLD burden across the Asia-Pacific, shaped by a complex interplay of socioeconomic, cultural and healthcare-related factors. While the overall prevalence of MASLD remains high throughout the region, differences in incidence rates suggest that multiple contextual elements can influence disease dynamics. Rapid urbanisation and economic growth in parts of South and South-East Asia appear to be associated with shifts in dietary patterns, including increased consumption of processed foods, sugar-sweetened beverages and higher-fat diets, which may contribute to the rising incidence

of MASLD in countries such as India, Bangladesh and Thailand.[20] These factors may help interpret the descriptively observed inverse U-shaped pattern between SDI and MASLD burden. In lower SDI regions, rapid urbanisation, dietary transitions and limited healthcare access increase prevalence. In higher SDI regions, preventive care, health education and accessible medical services reduce MASLD risk despite ongoing metabolic challenges. These regions also benefit from early detection of metabolic risk factors, widespread adoption of lifestyle modification programmes and robust public health interventions, which likely contribute to the observed stabilisation or decline in MASLD burden. Among these countries, high-income Asia Pacific countries, including Japan and the Republic of Korea, exhibit high prevalence but comparatively slower growth in incidence, potentially reflecting more established healthcare systems, higher public health awareness and earlier implementation of preventive strategies. Cultural and behavioural factors, such as dietary traditions, physical activity levels and perceptions of body weight, can interact with these economic and structural influences, while healthcare accessibility and policy frameworks further shape detection and management, with regions that have limited preventive care or screening, experiencing faster disease progression.[15 29–31] Environmental and demographic factors, such as urban density, sedentary lifestyles and population ageing, may also modulate these patterns.[32 33] Collectively, these findings highlight that MASLD burden in the Asia-Pacific region is multifactorial and context-dependent, with macro-level drivers, such as economic development, urbanisation, cultural practices and healthcare capacity, contributing to regional and national differences in disease trajectories.

Our second key finding is that MASLD is increasingly affecting both children and adolescents across all GBD-defined Asia-Pacific regions, highlighting a concerning shift towards early onset disease. Although MASLD prevalence reaches near-universal levels among older adults, incidence peaks in younger and middle-aged populations, indicating that the burden of MASLD is emerging much earlier than previously recognised. This early onset MASLD is likely influenced by lifestyle factors such as unhealthy diets, physical inactivity, urbanisation-related changes, as well as variations in healthcare access and early diagnosis among younger populations.[5 34] Rising childhood obesity, fuelled by high-calorie, nutrient-poor diets and sedentary behaviours, represents a major contributor.[20 35] Rapid urbanisation and socioeconomic transitions in South and South-East Asia have further promoted dietary shifts towards processed foods and sugar-sweetened beverages, exacerbating metabolic risk in younger populations.[36] Early exposure to metabolic disturbances, such as insulin resistance and dyslipidaemia, as well as genetic and epigenetic susceptibilities, may accelerate the development of MASLD.[18 37 38] However, the observed peak in the 20–24 years age group should be interpreted with caution, as age-specific incidence estimates may be influenced by increased screening intensity, broader use of imaging modalities, paediatric-to-adult healthcare transition effects and structural assumptions within the GBD modelling framework, particularly in age groups with limited primary data. Regardless of these considerations, the implications remain substantial, given that early onset MASLD is associated with an increased lifetime risk of progressive liver disease, advanced fibrosis, cirrhosis, hepatocellular carcinoma, as well as new-onset type 2 diabetes and cardiovascular disease.[26] These findings indicate the urgent need for public health and clinical interventions, including population-level promotion of healthy diets and physical activity, school-based nutrition and exercise programmes, and routine metabolic and hepatic screening in at-risk children and adolescents.[39 40] Early detection and lifestyle intervention for MASLD can meaningfully alter disease trajectories and prevent long-term liver-related and cardiometabolic complications.[39]

Building on these findings, our study highlights subregion-specific priorities. In South Asia, where MASLD incidence is particularly high among young adults, efforts should focus on early life interventions, including school-based nutrition programmes, community awareness campaigns on sedentary lifestyles and affordable access to preventive metabolic health services. For East Asia, where the prevalence is high but incidence growth is slower, priority measures should target strengthening existing healthcare infrastructure, improving metabolic screening coverage and promoting adherence to lifestyle modification programmes, particularly among middle-aged populations. Tailoring interventions to the demographic and epidemiological profiles of each subregion is essential to maximise the effectiveness of public health strategies.

Taken together, our findings highlight that MASLD is an emerging public health challenge across the Asia-Pacific region, demanding coordinated action at multiple levels. At the regional level, Central Asia and South-East Asia face high MASLD incidence among young adults, and interventions should focus on early lifestyle modification programmes targeting diet and physical activity, as well as routine metabolic screening in schools and communities. In Australasia, where MASLD prevalence is comparatively low and its growth remains slow, strengthening preventive healthcare services, public education campaigns and early fibrosis assessment may help maintain disease control. At the national level, policymakers should prioritise MASLD in health planning, incorporating surveillance, resource allocation and public awareness campaigns to address its rising prevalence and early onset trends. Within healthcare systems, the adoption of non-invasive diagnostic tools, such as the Fibrosis-4 index and vibration-controlled transient elastography, can facilitate the early detection of liver fibrosis, enabling timely intervention.[41 42] Integrated management of cardiometabolic risk factors, including obesity, diabetes, dyslipidaemia and hypertension, should be emphasised, as controlling these metabolic conditions can substantially reduce liver disease progression.[43 44] At the individual and community levels, promoting healthy

diets, regular physical activity and routine metabolic screening is particularly important for children and adolescents.[45 46] Coordinated implementation of these strategies across regional, national and community levels is critical to curbing MASLD's trajectory, preventing long-term liver-related and cardiometabolic complications and safeguarding the health of future generations.[47]

China spotlight

China contributes a substantial share of MASLD burden in the Asia-Pacific region, largely reflecting its population size, rapid urbanisation and ongoing lifestyle transitions. GBD 2023 estimates indicate high prevalence among middle-aged adults, alongside a concerning rise in incidence among young adults and children, underscoring the growing importance of early onset MASLD.[48] In June 2024, the National Health Commission launched the 'China Body Weight Management Year' initiative to promote healthy weight, improve metabolic health and prevent obesity-related complications. This initiative emphasises both adult interventions and early life strategies, including school-based and community-based programmes to improve diet quality, increase physical activity and strengthen routine metabolic screening. Such coordinated efforts provide an important opportunity to curb MASLD progression from early life, reduce long-term liver and cardiometabolic complications, and potentially inform broader MASLD prevention strategies across the Asia-Pacific region.

Strengths and limitations

The present study benefits from the comprehensive and standardised nature of the latest GBD 2023 data set, allowing robust comparisons across countries, regions and demographic groups, as well as age-specific and sex-specific analyses that can inform targeted prevention and intervention strategies. Nonetheless, several limitations should be acknowledged. First, GBD estimates rely on complex modelling approaches that integrate heterogeneous data sources. Differences in reporting quality, underdiagnosis and diagnostic criteria across countries may lead to underestimation of MASLD burden, especially in low-resource settings. Moreover, combining multiple data sources can introduce additional variability in regions with sparse or incomplete data, potentially affecting the accuracy and precision of estimates. Second, MASLD is often asymptomatic and under-recognised, and its detection frequently depends on non-invasive tests or imaging methods that are not universally available. Furthermore, inconsistent use of diagnostic coding in health records may further obscure the true prevalence of the disease. Third, individual-level determinants, including dietary patterns, physical activity, obesity, insulin resistance, genetic susceptibility and socioeconomic factors, are not fully captured in the GBD data set, which limits the ability to assess fine-grained risk profiles. Fourth, regional disparities in healthcare infrastructure, access to preventive services and diagnostic capacity may influence both identification and reporting of MASLD cases, potentially biasing observed temporal trends. Fifth, the observed peak in MASLD incidence among young adults aged 20–24 years warrants careful interpretation. This pattern may reflect, in part, variations in diagnostic intensity, GBD model assumptions, trends in obesity and diabetes, coding practices and paediatric-to-adult transition effects. While the GBD data provide the best available estimates, further studies are needed to explore these contributing factors in greater detail. Sixth, although GBD provides standardised metrics for cross-population comparisons, it may not fully reflect rapid lifestyle transitions, environmental exposures or recent policy interventions that influence MASLD epidemiology. Finally, GBD 2023 does not provide a separate category for metabolic dysfunction and alcohol-associated liver disease, and alcohol thresholds are incorporated within the NAFLD definition. Although evolving clinical nomenclature allows further subclassification, this subgroup likely represents a relatively small proportion and is unlikely to materially influence the overall burden estimates reported in this study.

CONCLUSION

MASLD has become an increasingly significant public health issue in the Asia-Pacific region, with significant regional differences and a rising number of incident cases, particularly among younger populations. The study shows that the prevalence and incidence rates of MASLD have been increasing across most regions over the past three decades, particularly in South Asia and Central Asia, whereas high-income areas have experienced more stable trends. These findings further underscore the need for targeted strategies, including improvements in healthcare systems, enhanced public health initiatives and a focus on prevention, to effectively manage the growing burden of MASLD and its long-term health implications.

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