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Association of life's essential 8 as a Cardiovascular Health Index with risk of chronic kidney disease; a systematic review and meta-analysis

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ABSTRACT

Introduction: Due to the close association between chronic kidney disease (CKD) and cardiovascular disease (CVD), maintaining optimal cardiovascular health (CVH) may serve as a preventive strategy to reduce the risk of CKD and its related health burden. Therefore, this study aimed to investigate the association between Life's Essential 8 (LE8) and the risk of CKD.

Materials and Methods: This study systematically searched the Cochrane, Embase, PubMed, ProQuest, Web of Science, Scopus, and Google Scholar databases up to April 26, 2025. Data analysis was performed using IBM SPSS Statistics version 19 and STATA version 14.

Results: An increase in the LE8 score was associated with a reduced risk of CKD, as indicated by the odds ratio (OR: 0.74, 95% CI: 0.67–0.82) and hazard ratio (HR: 0.60, 95% CI: 0.46–0.77). The protective effect of higher LE8 scores was observed across various subgroups: individuals aged 40–49 (OR: 0.81, 95% CI: 0.78–0.84), 50–59 (OR: 0.75, 95% CI: 0.60–0.94), males (OR: 0.81, 95% CI: 0.76–0.87), females (OR: 0.91, 95% CI: 0.87–0.95), and populations from the UK (OR: 0.60, 95% CI: 0.46–0.77), China (OR: 0.64, 95% CI: 0.63–0.65), and the USA (OR: 0.77, 95% CI: 0.72–0.81). Similarly, both cohort studies (OR: 0.66, 95% CI: 0.54–0.81) and cross-sectional studies (OR: 0.73, 95% CI: 0.66–0.81) confirmed this inverse association. Moreover, compared to low LE8 scores, moderate (OR: 0.58, 95% CI: 0.52–0.65) and high (OR: 0.43, 95% CI: 0.35–0.53) LE8 scores were significantly associated with reduced CKD risk.

Conclusion: An increase in the LE8 score was associated with a greater reduction in the risk of CKD in older age groups compared to younger ones, and in men compared to women. Moreover, the higher the LE8 score, the lower the risk of developing CKD.

Registration: This study has been compiled based on the PRISMA checklist, and its protocol was registered on the PROSPERO (ID: CRD420251043587) and Research Registry (UIN: reviewregistry2006) websites.

Implication for health policy/practice/research/medical education:
The findings from the meta-analysis, revealed that both moderate and high levels of LE8 scores were significantly associated with reduced risk of chronic kidney disease (CKD) by 42% and 57%, respectively, compared to low LE8 scores. Subgroup analysis demonstrated that higher LE8 scores were associated with lower CKD risk in various populations: 19% reduction among individuals aged 40–49, 25% in those aged 50–59, 19% in men, and 9% in women.

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Meta-analysis

Introduction

Chronic kidney disease (CKD) affects approximately 10% of the global population (1) and ranks among the top ten non-communicable diseases contributing significantly to mortality and disability (2). It is projected that by 2040, CKD will become the fifth leading cause of death worldwide (3). CKD is a multifactorial condition influenced by both environmental and genetic factors (4).

As CKD progresses, the risk of end-stage renal disease (ESRD), cardiovascular disease (CVD), and all-cause mortality increases (5-7). Given the close link between CKD and CVD, promoting cardiovascular health (CVH) has been proposed as a potential preventive strategy to reduce the risk of CKD (8,9).

In 2010, the American Heart Association (AHA) introduced the Life's Simple 7 (LS7) metric to assess CVH. LS7 included seven components: smoking status, body mass index (BMI), diet, physical activity, blood pressure, blood glucose, and total cholesterol. Higher LS7 scores were associated with greater longevity, improved quality of life, and lower CVD risk (10-12). In 2022, the AHA updated this framework and introduced Life's Essential 8 (LE8), which includes the original seven components plus an additional metric: sleep health (13). LE8 offers a more nuanced scoring system that captures interpersonal and intrapersonal variations and places greater emphasis on mental well-being to support or enhance CVH (14,15). Previous research has shown that higher LS7 scores are associated with a lower risk of CKD (9,16,17). Additionally, other studies have highlighted the link between sleep duration and quality with CKD risk (18,19). Therefore, LE8 may provide a more accurate and comprehensive assessment for predicting CKD risk. In light of this, the present study aimed to evaluate the association between LE8 and CKD risk through a systematic review and meta-analysis.

Materials and Methods

This article was conducted based on the PRISMA statement (20) and its protocol was registered in PROSPERO (International Prospective Register of Systematic Reviews) and research registry websites.

Search strategy

Cochrane, Embase, PubMed, ProQuest, Scopus, Web of Science, and Google Scholar databases were searched by the authors with no time and ethnic restrictions until April 26, 2025. The keywords were electronic and hand-searched using medical subject headings (MeSH) and operators "AND" and "OR". Search strategy in Scopus: [Title-Abstract-Keyword (Chronic Kidney Disease OR Chronic Renal Insufficiency OR "Renal Insufficiency, Chronic") AND Title-Abstract-Keyword (Life's essential 8 OR LE8)].

PECO (Population, Exposure, Comparison, Outcomes)

The research population consisted of research evaluating the association between LE8 score and the risk of CKD. The exposure was an elevated high score of LE8, as compared to patients with low score of LE8. The main outcome was the association between LE8 score and CKD.

Inclusion criteria

Observational articles evaluating the relationship between LE8 score and the risk of CKD were included in this meta-analysis.

Exclusion criteria

Duplicated and non-observational research, incomplete research and studies lacking sufficient data, articles published in conferences, and low-quality studies were all excluded from this research.

Quality assessment

Two independent authors assessed study quality using the NOS, which awards up to one star per item (except for the comparison item), with total scores ranging from 0 (lowest quality) to 10 (highest quality) (21).

Data extraction

The authors separately extracted required data, including the author, study type, mean age of participants, study date, location, number of participants, the correlation between LE8 score and CKD (at a 95% CI) in total, males, and females.

Statistical analysis

Data were analyzed using the logarithm of the odds ratio (OR) and hazard ratio (HR), by merging all the articles. The extent of heterogeneity was measured by the I^2 index. The random effects model was employed for the analysis of panel data. Data were analyzed in STATA v14.0. Results exhibiting *P* values less than 0.05 were considered to possess statistical significance.

Results

Our search delivered 259 articles, of which 121 were omitted as they were duplicates. After checking abstracts, 6 out of the remaining 138 articles were omitted as they had not full text accessible. Of the remaining 132 articles, 48 were further omitted as they had no adequate data required for analyses. Likewise, 73 out of the remaining 84 articles were excluded due to other exclusion criteria, and 11 were finally included in this research (Figure 1). This study included 11 observational studies6 cross-sectional and 5 cohort studies with a combined sample

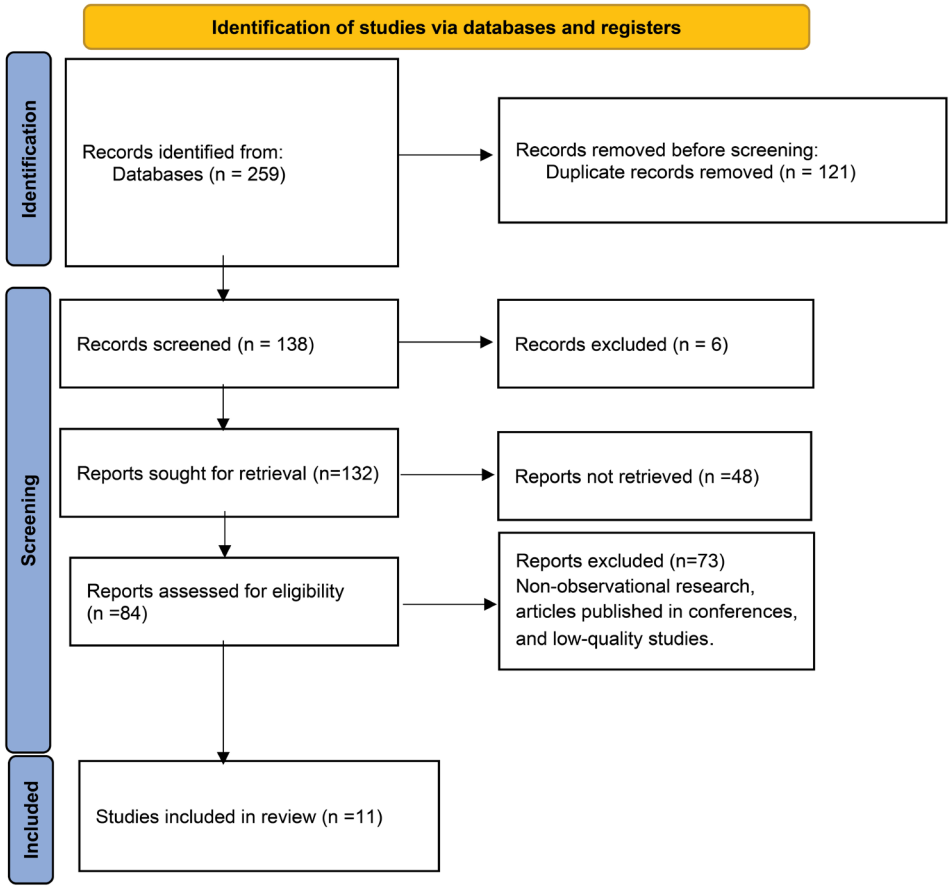

Figure 1. The flow chart of study selection (PRISMA).

size of 19,912,892 participants (Table 1).

As detected in Figure 2, higher LE8 scores were correlated with a decreased risk of CKD, with an OR of 0.74 (95% CI: 0.67–0.82) and a HR of 0.60 (95% CI: 0.46–0.77). Country-specific analyses revealed similar findings in the UK (OR: 0.60, 95% CI: 0.46–0.77), China (OR: 0.64, 95% CI: 0.63–0.65), and the USA (OR: 0.77, 95% CI: 0.72–0.81) (Figure 3). Both cohort (OR: 0.66, 95% CI: 0.54–0.81) and cross-sectional studies (OR: 0.73, 95% CI: 0.66–0.81) confirmed this inverse association (Figure 4).

Subgroup analyses revealed that increased LE8 scores were associated with a lower risk of CKD among individuals aged 40–49 years (OR: 0.81, 95% CI: 0.78–0.84), those aged 50–59 years (OR: 0.75, 95% CI: 0.60–0.94), men (OR: 0.81, 95% CI: 0.76–0.87), and women (OR: 0.91, 95% CI: 0.87–0.95) (Figures 5-7).

Additionally, compared to participants with low LE8 scores, those with moderate (OR: 0.58, 95% CI: 0.52–0.65) and high scores (OR: 0.43, 95% CI: 0.35–0.53) had a significantly lower risk of CKD (Figures 8 and 9).

In supplementary analyses, the funnel plot for publication bias did not show significant asymmetry (P = 0.078) (Figure 10).

Discussion

The findings from the meta-analysis, which included data from 19,912,892 participants across 11 observational studies, revealed that both moderate and high levels of LE8 scores were significantly associated with reduced risk of CKD by 42% and 57%, respectively, compared to low LE8 scores. Increases in LE8 scores were linked with a 26% reduction in CKD risk based on ORs and a 40% reduction based on HRs. Subgroup analyses also demonstrated that higher LE8 scores were associated with lower CKD risk in various populations: 19% reduction among individuals aged 40–49, 25% in those aged 50–59, 19% in men, and 9% in women. Regionally, the reductions were 40% in the UK, 36% in China, and 23% in the USA. Similar risk reductions were seen in cohort studies (34%) and cross-sectional studies (27%).

In a cross-sectional study by Chen et al, both moderate (OR: 0.62; 95% CI: 0.46–0.85) and high LE8 scores (OR: 0.32; 95% CI: 0.14–0.75) were significantly associated with reduced CKD risk (22). Liu et al reported that compared to low LE8 scores, moderate (OR: 0.54; 95% CI: 0.43–0.66) and high scores (OR: 0.18; 95% CI: 0.08–0.42) substantially decreased the risk of diabetic kidney disease (23). Similarly, Ren et al found that higher

Table 1. A summarized data of the investigations

First author, year	Location	Design	Sample size	Mean age (y)	Total score			Moderate score			High score		
					OR/HR	Low	Up	OR/HR	Low	Up	OR/HR	Low	Up
Chen W, 2025 (22)	USA	Cross-sectional	8907	≥20	0.81	0.72	0.91	0.62	0.46	0.85	0.32	0.14	0.75
Liu C, 2025 (23)	USA	Cross-sectional	18952666	59.72	0.71	0.65	0.78	0.54	0.43	0.66	0.18	0.08	0.42
Wei Y, 2025 (24)	USA	Cross-sectional	2522	59.55	0.75	0.68	0.84	0.56	0.42	0.75	0.32	0.15	0.7
He P, 2025 (25)	UK	Cohort	286908	56.1	0.73	0.72	0.75	0.5	0.47	0.53	0.31	0.27	0.34
Wang W, 2024 (26)	China	Cross-sectional	176874	55.2	0.64	0.63	0.65	NR	NR	NR	NR	NR	NR
Ruan YX, 2024 (27)	UK	Cohort	251825	56.4	0.97	0.97	0.98	0.56	0.6	0.72	0.53	0.46	0.59
Tang R, 2023 (28)	UK	Cohort	147988	37-73	0.23	0.18	0.31	0.61	0.52	0.72	0.43	0.35	0.53
Zhang Y, 2023 (29)	USA	Cross-sectional	25529	>20	0.71	0.67	0.75	0.48	0.43	0.55	0.36	0.3	0.42
Chen H, 2023 (30)	USA	Cohort	22420	47.18	0.82	0.79	0.86	0.53	0.47	0.59	0.45	0.37	0.54
Gao J, 2023 (31)	China	Cohort	7605 4688	54.32 56.11	NR NR	NR NR	NR NR	0.69 0.86	0.56 0.77	0.85 0.96	0.53 0.7	0.41 0.62	0.69 0.78
Ren Y, 2023 (32)	USA	Cross-sectional	24960	47.43	0.79	0.76	0.83	0.52	0.47	0.58	0.45	0.37	0.55

NR: Not reported; OR: Odds ratio; HR: Hazard ratio.

LE8 scores were inversely associated with CKD risk (OR: 0.79; 95% CI: 0.76–0.83) (32). These findings are consistent with our meta-analysis, particularly the analysis of cross-sectional studies, which confirmed that higher LE8 scores were associated with lower CKD risk.

In cohort studies, He et al observed that moderate (HR: 0.50; 95% CI: 0.47–0.53) and high (HR: 0.31; 95% CI: 0.27–0.34) LE8 scores significantly reduced CKD risk compared to low scores (25). Ruan et al also showed a strong inverse relationship among LE8 scores and CKD incidence (high vs. low: HR: 0.30; 95% CI: 0.27–0.33; median vs. low: HR: 0.53; 95% CI: 0.48–0.58) (27). These cohort-based results further validate the inverse relationship between LE8 and CKD found in the present study.

Additional evidence suggests that higher LE8 scores are associated not only with lower CKD risk but also with reduced risk of other renal-related conditions. For instance,

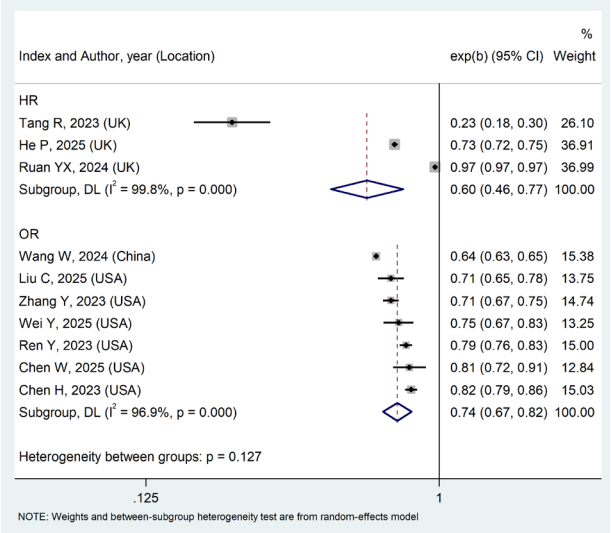

Figure 2. Forest plot demonstrating the relationship among LE8 score and CKD by index.

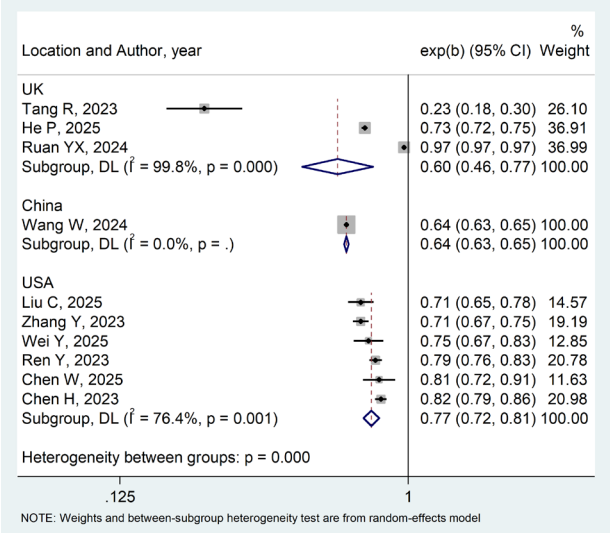

Figure 3. Forest plot demonstrating the relationship among LE8 score and CKD by location.

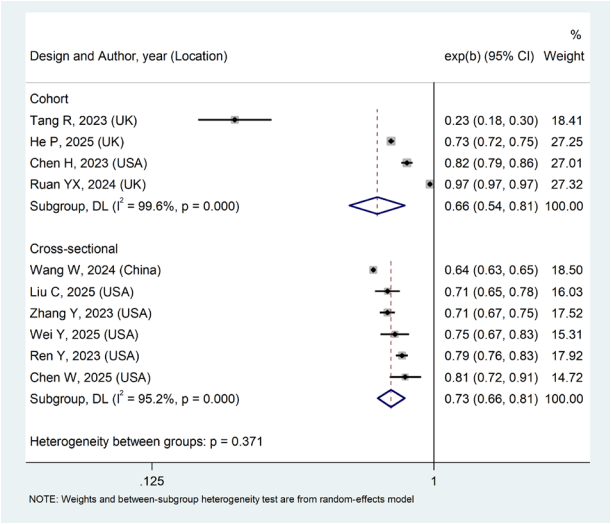

Figure 4. Forest plot demonstrating the relationship among LE8 score and CKD by design.

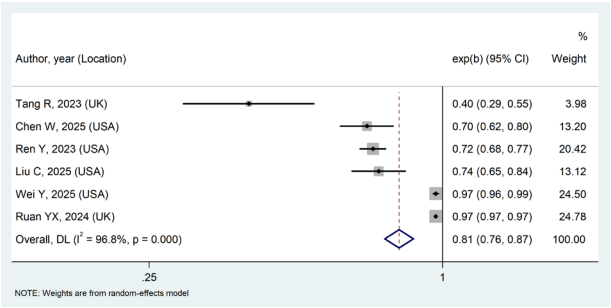

Figure 5. Forest plot demonstrating the relationship among LE8 score and CKD by mean age.

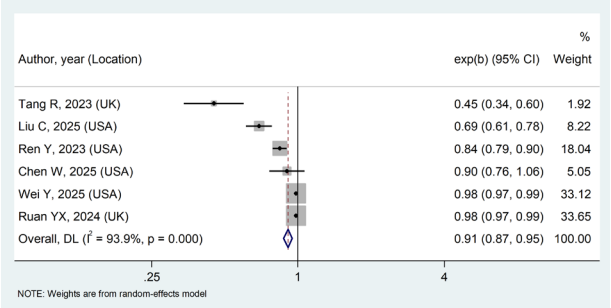

Figure 6. Forest plot showing the association between LE8 score and CKD in males.

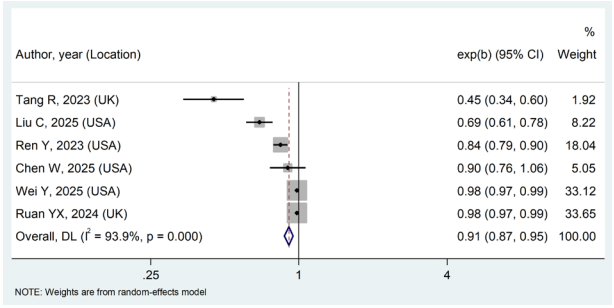

Figure 7. Forest plot showing the association between LE8 score and CKD in females.

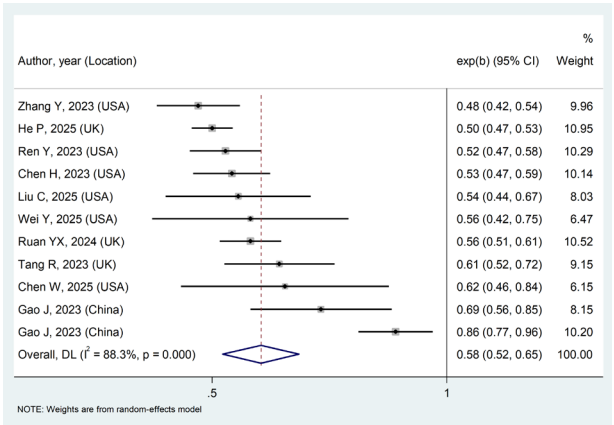

Figure 8. Forest plot showing the association between LE8 moderate level and CKD.

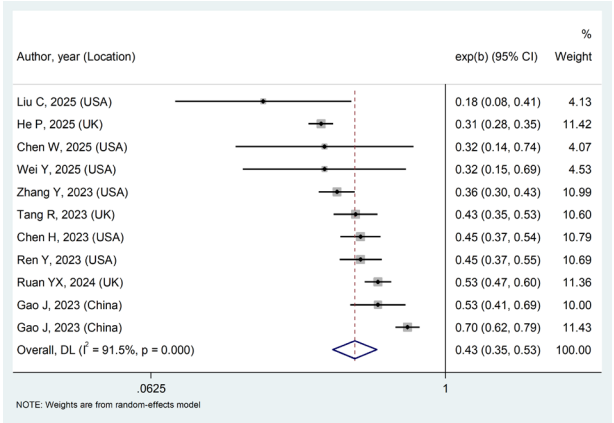

Figure 9. Forest plot showing the association between LE8 high level and CKD.

Wang et al reported that higher LE8 scores were linked to a lower risk of hyperuricemia (OR: 0.71; 95% CI: 0.69–0.73) in a cohort study (33), and similar findings were reported in a cross-sectional study (OR: 0.73; 95% CI: 0.72–0.75) (34). Du et al found that LE8 was inversely associated with kidney stone risk (OR: 0.81; 95% CI: 0.77–0.85) (35). These studies support the notion that LE8 is a comprehensive marker for kidney health.

LE8 has also been linked to reduced risk of other chronic diseases. Liu et al found that higher LE8 scores were associated with lower risk of rheumatoid arthritis (OR: 0.91; 95% CI: 0.75–0.87) (36). Sebastian et al, in a meta-analysis, reported a 53% lower risk of CVD in individuals with higher LE8 scores (HR: 0.47; 95% CI: 0.39–0.56) (37). Xiao et al observed that higher LE8 scores were associated with a reduced risk of gallstones (OR: 0.41; 95% CI: 0.26–0.64) (38), a finding corroborated by Zhao et al (OR: 0.41; 95% CI: 0.23–0.72) (39).

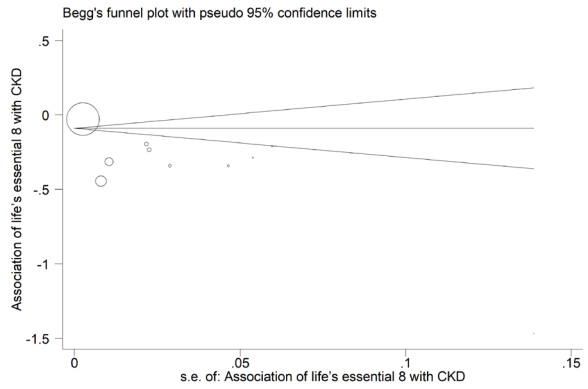

Figure 10. Diagram of publication bias.

Taken together, these findings suggest that improvements in CVH, as reflected in higher LE8 scores, may offer protective benefits against a range of chronic diseases, including CKD.

Conclusion

An increase in LE8 scores during the fifth decade of life (ages 40–49) was accompanying by a 6% greater diminution in CKD risk compared to the fourth decade. Moreover, the protective effect of higher LE8 scores was 10% greater in men than in women. A high LE8 score also reduced CKD risk by 15% more than a moderate score. Among the countries studied, the risk reduction associated with higher LE8 scores was greatest in the UK, followed by China and then the USA. In summary, older age, male gender, UK nationality, and a high LE8 score were significant factors associated with a lower risk of CKD in the studied population.

Limitations of the study

- The limited number of eligible studies included in this meta-analysis may be due to the fact that the LE8 metric was only introduced in 2022.
- The age subgroup analysis was restricted to seven studies due to inconsistent age stratifications, limiting generalizability.
- Only about half of the included studies reported gender-specific associations between LE8 and CKD risk, limiting the depth of gender-based analysis.

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Authors' contribution

Conceptualization: Saeid Bejarzehi, Fatemeh Vahmani, and Mohammad Rostamzadeh.
Data curation: Mohammad Rostamzadeh and Jalal Nourmohammadi.
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Investigation: Fatemeh Vahmani, Reza Faramarzzadeh, and Faeze Shafie Bafti.
Methodology: Amir Heidari and Fariba Jafari Khabaz.
Project management: Mohammad Rostamzadeh.
Supervision: Saeid Bejarzehi.
Validation: Jalal Nourmohammadi and Reza Faramarzzadeh.
Visualization: Reyhaneh Sadeghian.
Writing–original draft: All authors.
Writing–review and editing: All authors.

Conflicts of interest

There are no competing interests.

Ethical issues

This study has been compiled based on the PRISMA checklist, and its protocol was registered on the PROSPERO website (ID: CRD420251043587) and Research Registry website with (Unique Identifying Number [UIN]; reviewregistry2006). Besides, ethical issues (including plagiarism, data fabrication, and double publication) have been completely observed by the author.

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References

1. Bello A, Levin A, Tonelli M, Okpechi I, Feehally J, Harris D, et al. Assessment of global kidney health care status. JAMA. 2017;317:1864-81. doi: 10.1001/jama.2017.4046.
2. GBD Chronic Kidney Disease Collaboration. Global, regional, and national burden of chronic kidney disease, 1990-2017: a systematic analysis for the Global Burden of Disease Study 2017. Lancet. 2020;395:709-33. doi: 10.1016/S0140-6736(20)30045-3.
3. Vanholder R, Annemans L, Bello A, Bikbov B, Gallego D, Gansevoort R, et al. Fighting the unbearable lightness of neglecting kidney health: the decade of the kidney. Clin Kidney J. 2021;14:1719-30. doi: 10.1093/ckj/sfab070.
4. Song Y, Sung J, Lee K. Genetic and environmental influences on the associations between change in kidney function and changes in cardiometabolic factors in Koreans. Clin Exp Nephrol. 2017;21:474-80. doi: 10.1007/s10157-016-1295-3.
5. Nitsch D, Grams M, Sang Y, Black C, Cirillo M, Djurdjev O, et al. Associations of estimated glomerular filtration rate and albuminuria with mortality and renal failure by sex: a meta-analysis. BMJ. 2013;346:f324. doi: 10.1136/bmj.f324
6. Lees J, Welsh C, Celis-Morales C, Mackay D, Lewsey J, Gray S, et al. Glomerular filtration rate by differing measures, albuminuria and prediction of cardiovascular disease, mortality and end-stage kidney disease. Nat Med. 2019;25:1753-60. doi: 10.1038/s41591-019-0627-8.
7. Coresh J, Heerspink H, Sang Y, Matsushita K, Arnlov J,

Astor B, et al. Change in albuminuria and subsequent risk of end-stage kidney disease: an individual participant-level consortium meta-analysis of observational studies. Lancet Diabetes Endocrinol. 2019;7:115-27. doi: 10.1016/S2213-8587(18)30313-9.
8. Hou J, Li J, Huang J, Lu C, Zhou J, Liu Y, et al. Relationship between the exposure to cumulative cardiovascular health behaviors and factors and chronic kidney disease—The Kailuan study. PLoS One. 2018;13:e0203171. doi: 10.1371/journal.pone.0203171.
9. Cho S, Jeon J, Yoo T, Lee H, Lee Y, Kim H. Ideal cardiovascular health duration and risk of chronic kidney disease and cardiovascular disease. Heart. 2022;108:523-8. doi: 10.1136/heartjnl-2021-320180.
10. Lloyd-Jones D, Hong Y, Labarthe D, Mozaffarian D, Appel L, Van Horn L, et al. Defining and setting national goals for cardiovascular health promotion and disease reduction: the American Heart Association's strategic Impact Goal through 2020 and beyond. Circulation. 2010;121:586-613. doi: 10.1161/CIRCULATIONAHA.109.192703.
11. Polonsky T, Ning H, Daviglus M, Liu K, Burke G, Cushman M, et al. Association of cardiovascular health with subclinical disease and incident events: the Multi-Ethnic Study of Atherosclerosis. J Am Heart Assoc. 2017;6:e004894. doi: 10.1161/JAHA.116.004894.
12. M Isiozor N, Kunutsor S, Voutilainen A, Kurl S, Kauhanen J, A Laukkanen J. Association between ideal cardiovascular health and risk of sudden cardiac death and all-cause mortality among middle-aged men in Finland. Eur J Prev Cardiol. 2021 Mar 28:294-300. doi: 10.1177/2047487320915338.
13. Lloyd-Jones D, Allen N, Anderson C, Black T, Brewer L, Foraker R, et al. Life's essential 8: updating and enhancing the American Heart Association's construct of cardiovascular health: a presidential advisory from the American Heart Association. Circulation. 2022;146:e18-43. doi: 10.1161/CIR.0000000000001078.
14. Lloyd-Jones D, Ning H, Labarthe D, Brewer L, Sharma G, Rosamond W, et al. Status of cardiovascular health in US adults and children using the American Heart Association's new "Life's Essential 8" metrics: prevalence estimates from the National Health and Nutrition Examination Survey (NHANES), 2013 through 2018. Circulation. 2022;146:822-35. doi: 10.1161/CIRCULATIONAHA.122.060911.
15. Wang X, Ma H, Li X, Heianza Y, Manson J, Franco O, et al. Association of cardiovascular health with life expectancy free of cardiovascular disease, diabetes, cancer, and dementia in UK adults. JAMA Intern Med. 2023;183:340-9. doi: 10.1001/jamainternmed.2023.0015.
16. Ogunmoroti O, Allen N, Cushman M, Michos E, Rundek T, Rana J, et al. Association between Life's Simple 7 and noncardiovascular disease: the Multi-Ethnic Study of Atherosclerosis. J Am Heart Assoc. 2016;5:e003954. doi: 10.1161/JAHA.116.003954.
17. Rebholz CM, Anderson CA, Grams ME, Bazzano LA, Crews DC, Chang AR, et al. Relationship of the American Heart Association's Impact Goals (Life's Simple 7) with risk of chronic kidney disease: results from the Atherosclerosis Risk in Communities (ARIC) Cohort Study. J Am Heart Assoc. 2016;5:e003192. doi: 10.1161/JAHA.116.003192.
18. Hao Q, Xie M, Zhu L, Dou Y, Dai M, Wu Y, et al. Association of sleep duration with chronic kidney disease and proteinuria in adults: a systematic review and dose–response meta-analysis. Int Urol Nephrol. 2020;52:1305-20. doi: 10.1007/s11255-020-02488-w.
19. Yamamoto R, Shinzawa M, Isaka Y, Yamakoshi E, Imai E, Ohashi Y, et al. Sleep quality and sleep duration with CKD are associated with progression to ESKD. Clin J Am Soc Nephrol. 2018;13:1825-32. doi: 10.2215/CJN.01340118
20. Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev J. 2015;4:1e9. doi: 10.1186/2046-4053-4-1.
21. Stang A. Critical evaluation of the Newcastle-Ottawa scale for the assessment of the quality of nonrandomized studies in meta-analyses. Eur J Epidemiol. 2010;25:603e5.
22. Chen W, Tang Y, Si Y, Tu B, Xiao F, Bian X, et al. Association of life's essential 8 with prevalence and all-cause mortality of chronic kidney disease among US adults: Results from the National Health and Nutrition Examination Survey (2015–2018). J Transl Int Med. 2025;12:581-91. doi: 10.1515/jtim-2023-0119.
23. Liu C, Yang J, Li H, Deng Y, Dong S, He P, et al. Association between life's essential 8 and diabetic kidney disease: a population-based study. Ren Fail. 2025;47:2454286. doi: 10.1080/0886022X.2025.2454286.
24. Wei Y, Yu J. Association Between Life's Essential 8 and Diabetic Kidney Disease in Patients With Diabetes Mellitus: Evidence From National Health and Nutrition Examination Survey 2005-2018. Endocr Pract. 2025;31:326-32. doi: 10.1016/j.eprac.2024.12.010.
25. He P, Li H, Liu M, Ye Z, Zhou C, Zhang Y, et al. Life's Essential 8 scores, socioeconomic deprivation, genetic susceptibility, and new-onset chronic kidney diseases. Chin Med J (Engl). 2025;138:1835-42. doi: 10.1097/CM9.0000000000003491
26. Wang W, Zhang X, Zhang M, Zhang F, Li C, Yang C, et al. Extreme temperature events,"Life's Essential 8", and prevalence of chronic kidney disease: A nationally representative surveillance in China. Environ Int. 2024;194:109176. doi: 10.1016/j.envint.2024.109176
27. Ruan Y, Wu M, Gao J, Guo D, Cai Y, Huang Z, et al. AHA Life's Essential 8 and new-onset CKD: a prospective cohort study from the UK Biobank. Clin Exp Nephrol. 2024;28:325-36. doi: 10.1007/s10157-023-02440-z.
28. Tang R, Wang X, Li X, Ma H, Liang Z, Heianza Y, et al. Adherence to Life's Essential 8 and incident chronic kidney disease: a prospective study of 147,988 UK Biobank participants. Am J Clin Nutr. 2023;118:804-11. doi: 10.1016/j.ajcnut.2023.08.007.
29. Zhang Y, Ning N, Fan X, Huang R, Ye Y, He Y, et al. Age-dependent interaction between Life's Essential 8 and chronic kidney disease: A national cross-sectional analysis. Prev Med. 2023;177:107763. doi: 10.1016/j.ypmed.2023.107763.

30. Chen H, Tang H, Huang J, Luo N, Zhang X, Wang X. Life's essential 8 and mortality in US adults with chronic kidney disease. Am J Nephrol. 2023;54:516-27. doi: 10.1159/000533257.
31. Gao J, Liu Y, Ning N, Wang J, Li X, Wang A, et al. Better life's essential 8 is associated with lower risk of diabetic kidney disease: a community-based study. J Am Heart Assoc. 2023;12:e029399. doi: 10.1161/JAHA.123.029399.
32. Ren Y, Cai Z, Guo C, Zhang Y, Xu H, Liu L, et al. Associations between life's essential 8 and chronic kidney disease. J Am Heart Assoc. 2023;12:e030564. doi: 10.1161/JAHA.123.030564.
33. Wang M, Meng H. Association between cardiovascular health assessed by life's essential 8 and hyperuricemia in US adults: the NHANES 2009-2020. Front Endocrinol (Lausanne). 2024;15:1445787.
34. Wang X, Fan J. Association between life's essential 8 and hyperuricemia among adults in the United States: insights from NHANES 2005–2018. Front Med (Lausanne). 2024;11:1455164. doi: 10.3389/fmed.2024.1455164
35. Du Y, Guo B, Hu H, Dong Q, Li Y, Zhang J, et al. Association between kidney stones and life's essential 8: a population-based study. World J Urol. 2024;42:274. doi: 10.1007/s00345-024-04994-3.
36. Liu F, Liu F, Wang H. Association between Life's Essential 8 and rheumatoid arthritis. Clin Rheumatol. 2024;43:2467-77. doi: 10.1007/s10067-024-07036-w.
37. Sebastian S, Shah Y, Paul H, Arsene C. Life's Essential 8 and the risk of cardiovascular disease: a systematic review and meta-analysis. Eur J Prev Cardiol. 2025;32:358-73. doi: 10.1093/eurjpc/zwae280.
38. Xiao Y, Zhao W, Zhao Q, Pang K, Gao Q, Yang X, et al. Exploring the association between life's essential 8 and gallstone disease in the US adult population: a population-based study utilizing NHANES data from 2017-2018. BMC Gastroenterol. 2024;24:453. doi: 10.1186/s12876-024-03545-9
39. Zhao Y, Liu X, Han J, Feng B, Yan C, Zhao J. The association between life's essential 8 and gallstones: A cross-sectional study. Sci Rep. 2025;15:4713. doi: 10.1038/s41598-025-89024-x