EDITORIAL

Epidemiology of urolithiasis: Between big data and field research

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The availability of the *Global Burden of Disease* (GBD) dataset for urolithiasis has revolutionized the recent knowledge of the epidemiology of urolithiasis.

GBD studies began in the early 1990s through the collaboration of the *World Health Organization* (WHO), the World Bank, the Harvard School of Public Health, and several other academic and research institutions and led to the publication of the first study in 1993 in the World Development Report (1).

The purpose of GBD studies is to assess the impact of different diseases and injuries on the health of the global population and across more than 200 countries.

GBD Study metrics are incidence, prevalence, *years lived with disability* (YLDs) and *disability adjusted life years* (DALYs). Incidence estimates the number of new cases of a disease, prevalence the rate of a disease in a population, YLD the loss of healthy life due to a disease and DALYs the number of years of life lost by the combination of life lost due to poor health and premature mortality for a specific disease or injury.

GBD was housed in the *Institute for Health Metrics and Evaluation* (IHME) becoming a very important tool for global health governance. providing valuable insights on a global scale into the causes, distribution, and impact of diseases and injuries (2, 3).

The main GBD resources are freely accessible (*http://ghdx.healthdata.org/*) through the IHME and include the GBD Results Tool, which allows searching, filtering, and downloading estimates by age, sex, and country; the *Global Health Data Exchange* (GHDx), which is a repository with complete datasets including documentation, input data, and metadata; and interactive visualizations (GBD Compare, country profiles) that can be used for presentations and quick analyses. All of this is free for non-commercial use, according to the IHME Free of Charge Non Commercial User Agreement.

The availability of this dataset has recently encouraged numerous authors to extensively analyze the subset of data related to the epidemiology of urolithiasis.

A PubMed search for the string "*Global Burden of Disease*" AND ("*urinary calculi*" OR "*urolithiasis*" OR "*nephrolithiasis*") performed on March 13, 2026, retrieved 29 papers that used the GBD dataset to evaluate various aspects of the epidemiology of urolithiasis between 2021 and 2025. Studies published in 2025 report data on the incidence, mortality, and disability-adjusted life years of urolithiasis globally and in some specific areas (*United States, Europe, China, India, BRICS*); in adulthood, working age, age over 55 years, young adults and adolescents, and pediatric age; in men and women; in comparison between 1990 and 2021, with projections up to 2030 and 2050. Other previous studies have analyzed data on the incidence, mortality, and morbidity of urolithiasis in the period from 1990 to 2019.

Some observations are original and, in part, surprising, as they contradict, to some extent, previous beliefs that seemed very solid.

Analysis of GBD data has led to the conclusion that the annual number of incident cases of urolithiasis worldwide in 2021 was 106 million (67% of which were men) whereas in 2000, the estimated incident cases were 81.3 million (4). However, when the data was adjusted for population growth and aging and expressed as global age-standardized incidence, a downward trend was observed from 1,450 cases per 100,000 inhabitants in 2000 to 1,240 cases per 100,000 inhabitants, showing a reduction of 17.5%.

The decrease was observed in numerous geographic areas including Europe (Eastern, Central and Western), high-income North America, Australasia and Oceania, high-income Asia Pacific, east and southeast Asia, and most sub-Saharan Africa. On the contrary, incidence was still increasing in the remaining regions, including Latin America (Southern, Andean, Caribbean, Central, Tropical), North Africa and Middle East, South Asia, Central Asia, and part of sub-Saharan Africa.

These data are interesting because comparison between geographically and culturally different countries allows investigation into the potential effect of different environmental factors on the incidence of the disease. However, some limitations of the GBD Study need to be borne in mind when considering GBD Study results. GBD combines extremely large and heterogeneous datasets with a complex methodology, with heavy reliance on modelling where data are weak, and large and often under-discussed uncertainty intervals. It must be well kept in mind that

GBD numbers are not observed data but modelled estimates.

In a previous paper (5), the methodology for the analysis of the global burden of diseases and injuries was presented in details explaining that the data used for evaluating the estimates published in the GBD database are identified in "*censuses, household surveys, civil registration and vital statistics, disease registries, health service use, air pollution monitors, satellite imaging, disease notifications, and other sources*." These data are obtained from "*systematic review of published studies, searches of government and international organization websites, published reports, primary data sources such as the Demographic and Health Surveys, and contributions of datasets by GBD collaborators*."

For the analysis of the 2019 data, 31,499 and 19,773 sources reporting incidence and prevalence, respectively, were used. Metadata for each source included in GBD is publicly available in the GHDx.

Data used for reporting are corrected to the reference definition or measurement method and modelled using standardized tools as *Cause of Death Ensemble model* (CODEm), *spatiotemporal Gaussian process regression* (ST-GPR), and DisMod-MR. In particular, DisMod-MR is a Bayesian metaregression tool used to enforce consistency between epidemiological parameters of incidence, prevalence, and mortality for a disease.

In the dataset used for the study of urolithiasis (4), data input used to estimate incidence of urolithiasis included hospital inpatient admissions from 47 locations and health insurance claims from USA, Poland and Taiwan. Data of hospital inpatient admission were extracted when a defining code for urolithiasis was the primary discharge diagnosis.

Prevalence data, however, were not estimated and only mortality and DALY rates, in addition to incidence data, were considered.

A search of sources on GHDx *http://ghdx.healthdata.org/* on 14 March 2026 using the enter term "*urolithiasis*" found only 744 items, while 3293 items were found for "*obesity*" and 5699 items for "*hypertension*."

Filtering the search by geography, 251 items were attributed to high-income North America (of which 225 to the United States of America) and 190 to Europe. For other geographical regions the number of items is a little lower such as Southeast Asia (n = 40), Australasia (n = 38), North Africa and Middle East (n = 80) and Latin America (n = 86 of which Andean n = 22, Central n = 23, Southern n = 22, Tropical n = 19).

On the contrary, for other large geographic areas such as high-income Asia Pacific (n = 12), South Asia (n = 24), Central Asia (n = 12), and Sub-Saharan Africa (n = 14), the number of items found was much smaller. For example, for high-income Asia Pacific only 14 items were retrieved (prevalence studies n = 6 and incidence studies n = 5 in Japan and Korea, n = 2 administrative studies of the Singapore Renal Registry Report 2005-2008, plus IHME Cause of Death Ensemble Modeling Results), for Southern Asia 24 items (administrative data of Nepal hospital inpatient discharge 2011-16 n = 4, Kerala cause of death reports 2011-20 n = 9, Karnataka cause of death reports 2016-20 n = 5, India Annual Health Survey Data 2010-2013 n = 3, Bangladesh Health Bulletin 2015 n = 1, India - Shillong Nazareth Hospital Inpatient Discharges 2014 n = 1 plus IHME Cause of Death Ensemble Modeling Results 2010 n = 1), for sub-Saharan Africa 14 items (administrative data of Kenya National Inpatient Morbidity and Mortality Statistics 1999 n =1, Madagascar Health Statistical Yearbook 1999-2016 n = 12, plus Cause of Death Ensemble Modeling Results 2010 n=1) and for Andean Latin America 22 items (administrative data of Ecuador hospital inpatient discharges 1993-2012 n = 21, plus IHME Cause of Death Ensemble Modeling Results 2010 n = 1).

It should be noted that for some regions, the data comes almost exclusively from a single country (Madagascar for the sub-Saharan area, Ecuador for Andean Latin America).

From this limited number and quality of the items considerd for some geographic regions, it seems that the lack of information for some specific countries had to be filled with massive data imputation where primary data is missing.

Furthermore, the sources disclosed by GBD are not accompanied by a description of the methods by which they were found, by the inclusion/exclusion criteria used in the study, and an assessment of their quality as provided for by the PRISMA 2020 guidelines (Preferred Reporting Items for Systematic reviews and Meta-Analyses) and the GATHER guidelines (Guidelines for Accurate and Transparent Health Estimates Reporting) in order to offer a quality check to ensure accuracy and transparency.

Considering these observations, it is confirmed that there is still a role for systematic reviews of prevalence and incidence data on urolithiasis that use a transparent and verifiable methodology, and above all the importance of continuing to collect and publish epidemiological data on urolithiasis gathered through field surveys.

In this issue of Archivio Italiano di Urologia e Andrologia (13), a systematic review of the prevalence and incidence of urolithiasis in Europe and Latin America has been published, filling a gap in the literature where reviews were available for many other geographical areas (6-8) but not for Europe and Latin America.

The review demonstrated that the prevalence of urolithiasis in Europe has remained stable at around 7% over the past 40 years, although some studies (9, 10) observed an increasing trend between 1980 and 2000, which was not

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confirmed in subsequent years. Incidence values are quite heterogeneous, however, a series of studies on the incidence of hospital admissions for urolithiasis in England confirms a stable incidence of urolithiasis in Europe over the past 20 years (11). The prevalence of urolithiasis in Latin America remained lower than in Europe.
The discrepancy with the GBD data, which demonstrated a decrease in the incidence of urolithiasis over the past 20 years, could be explained by the greater dynamism of the GBD data, which may be able to more promptly detect changing trends of epidemiology thanks to continuous updating.
In conclusion, the combined analysis of GBD data and traditional systematic reviews still appears to be the preferable approach for studying the epidemiology of urolithiasis, pending the resolution of the critical issues of GBD studies regarding the reliability and completeness of their sources, possible biases in data collection and data modeling (12).

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