**Letter to Editor (Journal of Medical Entomology)**

**The worst year for dengue cases and deaths: global landmark of 6 M and 6000 deaths in 2023**

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**To-the-Editor,**

**Abstract**

In 2023, the world has observed a historic milestone of over 6 million cases and 6000 deaths due to dengue virus (DENV) infection. South America (3908400 cases and 1946 deaths) and Asia (1398762 cases and 3436 deaths) were hotspots with more than two-thirds of the global cases and deaths. Globally, in 2023, the overall number of dengue cases per million was 387000.03 cases /M and 10.11 deaths/M while Bangladesh (XX) and Peru (XX) reported the highest number of deaths per million population (among the countries with >1 population). A global response to control DENV infection including vaccine development, vector control, public health response and improved clinical management is highly essential.

Dengue fever, a mosquito-borne illness, is caused by four distinct serotypes of the dengue virus within the Flaviviridae family. Transmission to humans occurs through the bites of *Aedes aegypti (L.)* and *Aedes albopictus* (Skuse) mosquitoes. Currently, Dengue Virus (DENV) is endemic in over 125 countries, with reported cases to the World Health Organization (WHO) escalating annually. While the majority of infections (>80%) exhibit no or mild symptoms, leading to lifelong immunity against the specific serotype, reinfection with different serotypes, termed secondary or tertiary dengue infection, poses a significant risk of severe dengue, potentially culminating in fatal outcomes.

**Method:** We collected data on dengue cases and deaths from multiple sources: including ECDC (ref), WHO PAHO region (Ref), WHO Afro (Ref), and Ministry of Health different countries (DGHS, BD). We used the national data to accumulate cases by country, continent, and the world.

**Results:**

Globally, a total of 6.19 M cases and 6519 deaths were recorded in 2023. Content wise highest number of cases were reported from South America (XX cases) and highest deaths were reported in Asia (XX deaths).

In 2023, two distinct hotspots of dengue virus circulation emerged: the South American region and the South and Southeast Asian region (see Table 1). Among the top five countries with DENV infections in 2023 were Brazil (2,569,746 cases), Bangladesh (321,179 cases), Peru (264,764 cases), Mexico (216,277 cases), and Burkina Faso (237,291 cases). Additionally, three European countries reported indigenous dengue cases in 2023: Italy (82 cases), France (43 cases), and Spain (3 cases), while the United States documented a record 156 locally transmitted cases of DENV.

Table 1:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Country | WHO regions [1] | Continents [2] | Population | Case | Death | References |
| Cape Verde | WHO Region of Africa | Africa | 598682 | 410 | 0 | [3] |
| Sao Tome and Principe | WHO Region of Africa | Africa | 231856 | 69 | 0 | [3] |
| Anguilla | WHO Region of the Americas | North America | 15899 | 1 | 0 | [4] |
| Antigua | WHO Region of the Americas | North America | 94298 | 254 | 0 | [4] |
| Aruba | WHO Region of the Americas | South America | 106277 | 22 | 0 | [4] |
| Bahamas | WHO Region of the Americas | North America | 412623 | 243 | 1 | [4] |
| Barbados | WHO Region of the Americas | North America | 281995 | 771 | 0 | [4] |
| Belize | WHO Region of the Americas | North America | 410825 | 1688 | 0 | [4] |
| Bermuda | WHO Region of the Americas | North America | 64069 | 1 | 0 | [4] |
| Cayman Islands | WHO Region of the Americas | North America | 69310 | 42 | 0 | [4] |
| French Guiana | WHO Region of the Americas | South America | 312155 | 2684 | 0 | [4] |
| Grenada | WHO Region of the Americas | North America | 126183 | 628 | 1 | [4] |
| Guadeloupe | WHO Region of the Americas | North America | 395839 | 11751 | 7 | [4] |
| Guyana | WHO Region of the Americas | South America | 813834 | 27709 | 0 | [4] |
| Martinique | WHO Region of the Americas | North America | 366981 | 13239 | 6 | [4] |
| Montserrat | WHO Region of the Americas | North America | 4386 | 6 | 0 | [4] |
| Saint Barthelemy | WHO Region of the Americas | North America | 10994 | 737 | 0 | [4] |
| Saint Kitts | WHO Region of the Americas | North America | 47755 | 284 | 1 | [4] |
| Saint Lucia | WHO Region of the Americas | North America | 180251 | 60 | 0 | [4] |
| Saint Martin | WHO Region of the Americas | North America | 32077 | 1272 | 0 | [4] |
| Saint Vincent | WHO Region of the Americas | North America | 103698 | 15 | 0 | [4] |
| Sint Maarten | WHO Region of the Americas | North America | 44222 | 1 | 0 | [4] |
| Suriname | WHO Region of the Americas | South America | 623236 | 279 | 3 | [4] |
| Turks and Caicos Islands | WHO Region of the Americas | North America | 46062 | 182 | 0 | [4] |
| Virgin Islands | WHO Region of the Americas | North America | 98750 | 7 | 0 | [4] |
| Maldives | WHO South-East Asia Region | Asia | 521021 | 3223 | 0 | [5] |
| New Caledonia | WHO Western Pacific Region | Oceania | 292991 | 4 | 0 | [6] |
|  |  |  | 16979773 | 65582 | 19 |  |

Table 2: Worldwide dengue cases and deaths per million population

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Country | WHO regions [1] | Continents [2] | Population | Case | Death | Cases/million | Deaths/million | References |
| Afghanistan | WHO Eastern Mediterranean Region | Asia | 42239854 | 1700 | 1 | 40.24635 | 0.02 | [7] |
| Oman | WHO Eastern Mediterranean Region | Asia | 4644384 | 2016 | 0 | 434.0726 | 0 | [7] |
| Pakistan | WHO Eastern Mediterranean Region | Asia | 240485658 | 24352 | 0 | 101.2618 | 0 | [7] |
| Saudi Arabia | WHO Eastern Mediterranean Region | Asia | 36947025 | 2259 | 0 | 61.14159 | 0 | [7] |
| Somalia | WHO Eastern Mediterranean Region | Africa | 18143378 | 755 | 1 | 41.61298 | 0.02 | [7] |
| Sudan | WHO Eastern Mediterranean Region | Africa | 48109006 | 10412 | 66 | 216.4252 | 0.3 | [7] |
| Yemen | WHO Eastern Mediterranean Region | Asia | 34449825 | 951 | 1 | 27.60537 | 0.04 | [7] |
| France | WHO European Region | Europe | 64756584 | 43 | 0 | 0.664025 | 0 | [8] |
| Italy | WHO European Region | Europe | 58870762 | 82 | 0 | 1.392882 | 0 | [8] |
| Spain | WHO European Region | Europe | 47519628 | 3 | 0 | 0.063132 | 0 | [8] |
| Benin | WHO Region of Africa | Africa | 13712828 | 6 | 1 | 0.437547 | 2.29 | [3] |
| Burkina Faso | WHO Region of Africa | Africa | 23251485 | 146878 | 688 | 6316.93 | 0.11 | [3] |
| Chad | WHO Region of Africa | Africa | 18278568 | 1342 | 1 | 73.41932 | 0.01 | [3] |
| Ethiopia | WHO Region of Africa | Africa | 126527060 | 21469 | 17 | 169.6791 | 0.1 | [3] |
| Ghana | WHO Region of Africa | Africa | 34121985 | 18 | 0 | 0.527519 | 0 | [3] |
| Guinea | WHO Region of Africa | Africa | 14190612 | 1 | 0 | 0.070469 | 0 | [3] |
| Ivory Coast | WHO Region of Africa | Africa | 28873034 | 3895 | 27 | 134.901 | 0.2 | [3] |
| Mali | WHO Region of Africa | Africa | 23293698 | 4427 | 29 | 190.0514 | 0.15 | [3] |
| Mauritius | WHO Region of Africa | Africa | 1300557 | 265 | 0 | 203.7589 | 0 | [3] |
| Niger | WHO Region of Africa | Africa | 27202843 | 148 | 0 | 5.440608 | 0 | [3] |
| Nigeria | WHO Region of Africa | Africa | 223804632 | 72 | 0 | 0.321709 | 0 | [3] |
| Senegal | WHO Region of Africa | Africa | 17763163 | 248 | 1 | 13.96148 | 0.07 | [3] |
| Togo | WHO Region of Africa | Africa | 9053799 | 8 | 1 | 0.883607 | 1.13 | [3] |
| Argentina | WHO Region of the Americas | South America | 45773884 | 130287 | 75 | 2846.317 | 0.03 | [4] |
| Bolivia | WHO Region of the Americas | South America | 12388571 | 156774 | 88 | 12654.73 | 0.01 | [4] |
| Brazil | WHO Region of the Americas | South America | 216422446 | 3088723 | 1184 | 14271.73 | 0.08 | [4] |
| Colombia | WHO Region of the Americas | South America | 52085168 | 131784 | 90 | 2530.164 | 0.04 | [4] |
| Costa Rica | WHO Region of the Americas | North America | 5212173 | 30649 | 0 | 5880.273 | 0 | [4] |
| Dominican Republic | WHO Region of the Americas | North America | 11332972 | 27972 | 62 | 2468.196 | 0.03 | [4] |
| Ecuador | WHO Region of the Americas | South America | 18190484 | 27838 | 33 | 1530.361 | 0.02 | [4] |
| El Salvador | WHO Region of the Americas | North America | 6364943 | 5788 | 0 | 909.3561 | 0 | [4] |
| Guatemala | WHO Region of the Americas | North America | 18092026 | 72358 | 119 | 3999.442 | 0.03 | [4] |
| Honduras | WHO Region of the Americas | North America | 10593798 | 34050 | 49 | 3214.145 | 0.02 | [4] |
| Jamaica | WHO Region of the Americas | North America | 2825544 | 8180 | 6 | 2895.018 | 0 | [4] |
| Mexico | WHO Region of the Americas | North America | 128455567 | 277963 | 203 | 2163.884 | 0.09 | [4] |
| Nicaragua | WHO Region of the Americas | North America | 7046310 | 181096 | 4 | 25700.83 | 0 | [4] |
| Panama | WHO Region of the Americas | North America | 4468087 | 20924 | 18 | 4682.988 | 0 | [4] |
| Paraguay | WHO Region of the Americas | South America | 6861524 | 63216 | 24 | 9213.114 | 0 | [4] |
| Peru | WHO Region of the Americas | South America | 34352719 | 274227 | 441 | 7982.687 | 0.06 | [4] |
| Puerto Rico | WHO Region of the Americas | North America | 3260314 | 1242 | 0 | 380.9449 | 0 | [4] |
| Trinidad | WHO Region of the Americas | North America | 1534937 | 126 | 0 | 82.08806 | 0 | [4] |
| Uruguay | WHO Region of the Americas | South America | 3423108 | 48 | 0 | 14.02234 | 0 | [4] |
| USA | WHO Region of the Americas | North America | 339996563 | 156 | 0 | 0.458828 | 0 | [4] |
| Venezuela | WHO Region of the Americas | South America | 28838499 | 4809 | 8 | 166.7563 | 0.05 | [4] |
| Bangladesh | WHO South-East Asia Region | Asia | 172954319 | 321179 | 1705 | 1857.016 | 0.92 | [5] |
| India | WHO South-East Asia Region | Asia | 1428627663 | 94198 | 91 | 65.936 | 1.38 | [5] |
| Indonesia | WHO South-East Asia Region | Asia | 277534122 | 70000 | 500 | 252.2212 | 1.98 | [5] |
| Myanmar | WHO South-East Asia Region | Asia | 54577997 | 4968 | 23 | 91.02569 | 0.25 | [5] |
| Nepal | WHO South-East Asia Region | Asia | 30896590 | 51243 | 20 | 1658.533 | 0.01 | [5] |
| Sri Lanka | WHO South-East Asia Region | Asia | 21893579 | 89799 | 61 | 4101.614 | 0.01 | [5] |
| Thailand | WHO South-East Asia Region | Asia | 71801279 | 159219 | 179 | 2217.495 | 0.08 | [5] |
| Australia | WHO Western Pacific Region | Oceania | 26439111 | 1023 | 0 | 38.69268 | 0 | [6] |
| Cambodia | WHO Western Pacific Region | Asia | 16944826 | 31567 | 39 | 1862.929 | 0.02 | [6] |
| China | WHO Western Pacific Region | Asia | 1425671352 | 17788 | 1 | 12.47693 | 0.08 | [6] |
| Laos | WHO Western Pacific Region | Asia | 7633779 | 31997 | 20 | 4191.502 | 0 | [6] |
| Malaysia | WHO Western Pacific Region | Asia | 34308525 | 120418 | 96 | 3509.857 | 0.03 | [6] |
| Philippines | WHO Western Pacific Region | Asia | 117337368 | 195603 | 657 | 1667.014 | 0.39 | [6] |
| Singapore | WHO Western Pacific Region | Asia | 6014723 | 9663 | 0 | 1606.558 | 0 | [6] |
| Vietnam | WHO Western Pacific Region | Asia | 98858950 | 166619 | 42 | 1685.422 | 0.02 | [6] |
|  |  |  | 8020167224 | 6124844 | 6672 | 136440.7 | 10.07 |  |

In the first 18 weeks of (May 22) 2024, laboratory-confirmed dengue cases surged to nearly 3.6 million with more than 3,577 deaths within the World Health Organization's (WHO) American region (PAHO), encompassing over 40 countries, territories, or islands. Countries in the northern hemisphere are bracing themselves for another potentially record-breaking year as the onset of summer and the rainy season draws near, eliciting a sense of anticipation and surprise among observers.

Table 2: Continent-wise dengue cases and deaths per million population

|  |  |  |  |
| --- | --- | --- | --- |
| Continents | Cases per million | Deaths per million | References |
| Africa | 122902.88 | 98.75 | [3] |
| Antarctica | 0.00 | 0.00 | - |
| Asia | 138001.37 | 597.45 | [7], [5], [6] |
| Europe | 2.11 | 0.00 | [9] |
| North America | 759913.79 | 284.67 | [4] |
| Oceania | 3235.57 | 0.00 | [6] |
| South America | 658335.49 | 374.53 | [4] |



**Map:** Global continent-wise map showing the number of dengue cases and deaths per million population in 2023

**Conclusion/suggestion:**

**Suggestion for global preparation – vaccination, clinical management, vector management**