

PERSPECTIVE

Dengue Preventive Strategies: Third World (My World) Entrepreneurs Wake Up and Please Stand Up

Deepak Gupta

MD Department of Anesthesiology, Wayne State University/Detroit Medical Center, Detroit, Michigan, United States

Abstract	Introduction	Methodology	Results	Conclusion	References	Citation	Tables / Figures
--------------------------	------------------------------	-----------------------------	-------------------------	----------------------------	----------------------------	--------------------------	----------------------------------

Corresponding Author

Address for Correspondence: Dr Deepak Gupta, Box No 162, 3990 John R, Detroit, MI 48201, United States

E Mail ID: dgupta@med.wayne.edu

Citation

Gupta D. Dengue Preventive Strategies: Third World (My World) Entrepreneurs Wake Up and Please Stand Up. Indian J Comm Health. 2015; 27, 4: 509-511.

Source of Funding: Nil **Conflict of Interest:** None declared

Article Cycle

Submission: 05/10/2015; **Revision:** 11/10/2015; **Acceptance:** 20/12/2015; **Publication:** 31/12/2015

Abstract

It has taken me almost 19 years and observing/enduring/ignoring 20 seasons of dengue fever in our country's capital, Delhi to finally say "Enough is enough". How many more precious lives dengue will consume before infrastructure resolves to fight back and eradicate dengue. Why the development of vaccine has been difficult for this mosquito borne disease. The good news is that the WHO has promising data accumulation in favor of live attenuated recombinant tetravalent dengue vaccine titled CYD-TDV that has taken up the arduous challenge to counter all four serotypes of dengue virus. Hopefully, by April 2016, the WHO may have their recommendations (if any) about how and when to use CYD-TDV. Subsequently, the ball will be in the court of dengue-endemic nations' regulatory authorities to take on the implementations of the WHO recommendations. Herein will lay the prerogative of dengue-endemic nations' physician-entrepreneurs/pharmaceutical-entrepreneurs in the Third World (my world) to take it upon them to ensure that although they have been slow to catch up (already 20 seasons have flown past), they should not miss the train now once the WHO publishes its recommendations in near future so that hopefully, the next season sees the dawn of hope and shifting of gears from economy-draining sluggish anti-dengue campaign to economy-driving future eradicate-dengue campaign initiating from the dengue-endemic nations across the world, including India.

Key Words

Dengue; Preventive Strategies

Introduction

I remember it like yesterday when I was reading Park's Textbook of Preventive and Social Medicine (14th Edition) (1) for my Final Professional Part-I examinations (we used to abbreviate the subject as SPM and the examination as Mini-Prof) during the fall of 1996-97. To us, dengue fever was a foreign disease (with a limited mention in our SPM textbook and I am pretty sure it was summarized in one page or so), and our focus was to excel know-how about our disease, malaria, to score good in our Mini-Prof. As the examinations drew nearer, we started cramming about dengue too because that year, an

"out-of-blue" epidemic of dengue happened in Delhi area and it was clearer to us that we will be tested about comparative differences of dengue vs. malaria in our written examination and/or viva-voce of SPM. The testing in new, current and rare diseases has often been the norm to motivate superlative medical students to score higher grades than the rest. I do not remember whether and where our knowledge about dengue fever was actually tested but October 1996's outbreak of dengue in Delhi (per the WHO Weekly Epidemiological Record (2) quoting The National Institute of Communicable Diseases, claiming 297 lives among 7427 cases with 4% mortality by October 1996 although later sources

have reported higher numbers for the completed season 1996-1997) led Park's Textbook of Preventive and Social Medicine (15th Edition) published in September 1997 (3) to broaden the coverage to two+ pages about dengue fever. By the time my sister read about dengue in the following years, SPM textbook (3) reinforced that first recorded outbreak of dengue fever (1812), its first serological survey (1952), its first double peak epidemic (1963-64), its recurring outbreaks (1967 & 1970) and confirmation of dengue's endemicity (1982) with exorbitant case/death numbers in 1996 in Delhi cried out loud and clear that dengue could NO LONGER be a foreign disease.

As time passed by, year after year, the only time we remembered about dengue were when rains started pouring and it was time to ensure mosquito nets, mosquito repellants and full sleeves clothes not only during the nights (for protection against malaria) but also during the daytimes (for protection against dengue). These measures became more labor-intensive and stress-inducing when the time came to move for further studies and future job in United States of America because visits back home during scheduled vacations often required the consideration for gravitas of prevalent dengue epidemic during the current season/year. During these times, my only and very limited contribution to the awareness about dengue was when last year, I guided in preparation and copy-editing of the manuscript titled POST-MONSOON SEASON SURVEILLANCE A MUST FOR CURTAILING ANNUAL DENGUE EPIDEMIC IN RURAL INDIA (4). However, it has taken me almost 19 years and observing/enduring/ignoring 20 seasons of dengue fever in our country's capital, Delhi to finally say "Enough is enough". Why this annual ritual for dengue prevention and management for few months and then to be forgotten for the rest of the year. How many more precious lives dengue will consume before infrastructure resolves to fight back and eradicate dengue. Why the development of vaccine has been difficult for this mosquito borne disease. Even the noble research processes and unique techniques used by Dr. Brian D. Foy and his team (5-8) over the last decade or so are still ongoing that focus on making the human blood potentially lethally toxic to the mosquitoes feeding on them so that vector burden of the mosquito borne diseases can be reduced or exterminated. My presumption is that this may or may not lead to mosquito populations

becoming potentially averse to feeding on humans and consequently start savoring non-human blood. My own personal unique perspective is that whether there can be scenario in future when mosquitoes ingesting on treated/vaccinated human blood become sterile/infertile (decreased to abolished egg production like with abortifacients) and subsequent environmental adaptation for survival in current mosquito populations may cause genetic changes (if that phenomenon is part of any living systems evolutionary learning to prevent loss-of-reproduction-based-extinctions) in future mosquito generations so they avoid (forget) feeding on "abortifacient" human blood.

In the real world, the good news is that the WHO under its Initiative for Vaccine Research (part of broader Dengue Vaccine Initiative) (9) has promising data accumulation in favor of live attenuated recombinant tetravalent dengue vaccine titled CYD-TDV that has taken up the arduous challenge to counter all four serotypes of dengue virus. Hopefully, by April 2016, the WHO Strategic Advisory Group of Experts on Immunization will have reviewed data, discussed pros-cons and accordingly might have advised the WHO their recommendations (if any) about how and when to use CYD-TDV. Subsequently, the ball will be in the court of dengue-endemic nations' regulatory authorities to take on the implementations of the WHO recommendations. Herein will lay the prerogative of dengue-endemic nations' physician-entrepreneurs/pharmaceutical-entrepreneurs to take it upon them to ensure that the economic value deemed to the lives saved/sick-days avoided per year and economic value deemed to the vaccines required per year to cover the whole population at-risk will further drive pharmaceutical-based national economies to greater heights. To analogously quote reports/data from influenza (flu) economics, with an estimated flu-related lost lives between 3K to 49K over a period of 30 years (1976-2006) (10) and an estimated total economic burden of 87.1 billion USD annually (C.I., 47.2 billion USD, 149.5 billion USD) due to flu seasons (base year burden estimated in 2003) (11), flu vaccination is an annual "must" in United States of America per Centers for Disease Control and Prevention leading to 1.6 billion USD worth flu-vaccine sales in 2011 that is forecasted to increase to 2.2 billion USD annually by 2018 (12). Learning from the historical and current examples of health economics of seasonal influenza and economics of flu vaccinations (13-18)

can inculcate rapid development of dengue vaccine as a great economic incentive and driving force for the physician-entrepreneurs/pharmaceutical-entrepreneurs so as to make or break the case of universal dengue vaccination for population at-risk in dengue-endemic nations.

In summary, although physician-entrepreneurs/pharmaceutical-entrepreneurs in the Third World (my world) have been slow to catch up (already 20 seasons have flown past), they should not miss the train now once the WHO publishes its recommendations in near future so that hopefully, the next season sees the dawn of hope and shifting of gears from economy-draining sluggish anti-dengue campaign to economy-driving future eradicate-dengue campaign initiating from the dengue-endemic nations across the world, including India.

References

1. Park K. Park's textbook of preventive and social medicine (14th edition). Jabalpur, India, Banarsidas Bhanot Publishers, 1994 (Reprinted 1996).
2. WHO (1996). Weekly Epidemiological Record. 1996 November 1;71(44):p335. Available from: <http://www.who.int/docstore/wer/pdf/1996/wer7144.pdf>
3. Park K. The dengue syndrome. In: Park's textbook of preventive and social medicine (15th edition). Jabalpur, India, Banarsidas Bhanot Publishers, 1997, pp 185-187.
4. Aggarwal P, Gupta P, Kandpal SD, Kakati B, Gupta D. Post-monsoon season surveillance a must for curtailing annual dengue epidemic in rural India. National Journal of Community Medicine. 2014 Jan-Mar;5(1):153-5. Available from: http://njcmindia.org/uploads/5-1_153-155.pdf
5. Sylla M, Kobylinski KC, Foy BD. Gates Grand Challenges Explorations award: Endectocides for Controlling Transmission of Mosquito-borne Diseases. MalariaWorld J. 2013 Mar;4(5). PMID: 24818085. PMCID: PMC4013271. Available from: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4013271/>
6. Foy BD, Magalhaes T, Injera WE, Sutherland I, Devenport M, Thanawastien A, Ripley D, Cárdenas-Freytag L, Beier JC. Induction of mosquitoicidal activity in mice immunized with *Anopheles gambiae* midgut cDNA. Infect Immun. 2003 Apr;71(4):2032-40. PMID: 12654823. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/12654823/>
7. Coleman Cornelius (Colorado State University-Fort Collins). Researcher: Fight malaria with deadly mosquito meals. Last updated: 2014 November 5. Available from: <http://source.colostate.edu/researcher-fight-malaria-deadly-mosquito-meals/>
8. Charles Choi (UPI Science News-New York). Vaccine makes blood toxic to mosquitoes. Last updated: 2003 April 14 (Fort Collins, Colorado). Available from: http://www.upi.com/Science_News/2003/04/14/Vaccine-makes-blood-toxic-to-mosquitoes/35231050359241/
9. WHO (2015). Dengue vaccine research. © WHO 2015. Available from: http://www.who.int/immunization/research/development/dengue_vaccines/en/
10. Centers for Disease Control and Prevention. Seasonal influenza Q&A. Questions and answers. Last reviewed: 2015 September 18. Last updated: 2015 September 18. Available from: <http://www.cdc.gov/flu/about/qa/disease.htm>
11. Molinari NA, Ortega-Sanchez IR, Messonnier ML, Thompson WW, Wortley PM, Weintraub E, Bridges CB. The annual impact of seasonal influenza in the US: measuring disease burden and costs. Vaccine. 2007 Jun 28;25(27):5086-96. PMID: 17544181. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17544181>
12. GBI Research. Seasonal Influenza Vaccines Market in Top Seven Countries to 2018 - Next Generation Quadrivalent Vaccines to Dominate the Market by Offering Broader Protection via Single Dose. Last updated: 2012 October. ref:plp2012. Available from: <http://www.reportlinker.com/p01023646-summary/Seasonal-Influenza-Vaccines-Market-in-Top-Seven-Countries-to-Next-Generation-Quadrivalent-Vaccines-to-Dominate-the-Market-by-Offering-Broader-Protection-via-Single-Dose.html>
13. Tozzi J. What a bad flu season could cost the U.S. economy. This year's unusually potent flu is bad news for most employers but great for drugstores. Last updated: 2014 December 10. ©2015 Bloomberg L.P. Available from: <http://www.bloomberg.com/news/articles/2014-12-10/flu-what-a-bad-influenza-season-could-cost-the-us-economy>
14. Baguelin M, Jit M, Miller E, Edmunds WJ. Health and economic impact of the seasonal influenza vaccination programme in England. Vaccine. 2012 May 14;30(23):3459-62. PMID: 22446636. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22446636>
15. Baguelin M, Hoek AJ, Jit M, Flasche S, White PJ, Edmunds WJ. Vaccination against pandemic influenza A/H1N1v in England: a real-time economic evaluation. Vaccine. 2010 Mar 11;28(12):2370-84. PMID: 20096762. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/20096762>
16. Luginer AK, van Boven M, de Vries R, Postma MJ, Wallinga J. Cost effectiveness of vaccination against pandemic influenza in European countries: mathematical modelling analysis. BMJ. 2012 Jul 12;345:e4445. PMID: 22791791. PMCID: PMC3395306. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22791791>
17. Prosser LA, Lavelle TA, Fiore AE, Bridges CB, Reed C, Jain S, Dunham KM, Meltzer MI. Cost-effectiveness of 2009 pandemic influenza A(H1N1) vaccination in the United States. PLoS One. 2011;6(7):e22308. PMID: 21829456. PMCID: PMC3146485. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/21829456>
18. Fisman DN, Tuite AR. Estimation of the health impact and cost-effectiveness of influenza vaccination with enhanced effectiveness in Canada. PLoS One. 2011;6(11):e27420. PMID: 22110645. PMCID: PMC3215749. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/22110645>