Received: 2018.06.01
Accepted: 2018.06.05
Published: 2018.06.15

The Challenge of Stress-Related Non-Communicable Diseases

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Funds Collection G

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Source of support: Self financing

The greatest challenge facing medicine today involves the so-called non-communicable diseases (NCDs). This is true regardless of whether one's location is considered high-income, middle-income, or low-income. Basic research at all "OMICs" system levels will be significant in uncovering causal links that create NCD vulnerabilities in mind, brain, body, and society. Therefore, meeting this 21st century challenge by improving NCD management and prevention around the world will rely on advancement in this type of basic research.

MeSH Keywords: **Centers for Disease Control and Prevention (U.S.) • Comorbidity • Integrative Medicine • Metabolic Syndrome X • Neurogenic Inflammation • Stress, Physiological**

Full-text PDF: <https://www.basic.medscimonit.com/abstract/index/idArt/911473>

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Basic Research and the NCD Challenge

The major health crisis in the 21st century involves stress-related NCDs: coronary artery disease, diabetes, chronic pulmonary and GI diseases, cancer, neuropsychiatric diseases (NPDs), and arthritides [1]. This problem is so important that the World Health Organization has developed a Global Action Plan and most recently has scheduled the WHO Global Conference on Noncommunicable diseases: Enhancing policy coherence between different spheres of policy by 2030. The Centers for Disease Control and Prevention (CDC) Division of Global Health Protection focuses on NCDs.

According to the CDC, the NCDs are responsible for more than 68% of deaths worldwide, and 75% of deaths in low- and middle-income countries [2]. NCDs are often preceded by stress-related metabolic syndrome (hypertension, high cholesterol, truncal obesity, and reduced responsiveness to insulin). Stress-related chronic NCDs continue to plague primary care practitioners, who at best can only slow progression of the disease. This results in enormous mortality, morbidity, and suffering and contributes to the ballooning of health care costs.

In 2011 a report from the Harvard TH Chan School of Public Health and commissioned by the World Economic Forum (WEF) focused on the expense of NCDs. They projected these costs in terms of the economic burden through 2030 [3]. The results of three different estimate methods projected enormous economic loss in the next 20 years associated with the care of heart, pulmonary, neoplastic, and neuropsychiatric diseases along with diabetes. Cumulatively, the predicted cost amounts to 47 trillion dollars. This is approximately three-quarters of the 2010 combined world global domestic product. The WEF report adds another layer of concern to the pain and suffering that individuals with NCDs face.

The NCD story unites our concept of all diseases and gives the lie to the artificial dualistic distinction between mental and physical diseases. This, of course, makes matters quite complex due to multimorbidity when we set about finding solutions. To get a sense of the scope of the problem, we can focus on the morbidity and cost of psychiatric and addiction disorders in theoretical isolation.

In 2013, Whiteford and colleagues, writing in the *Lancet*, reported that psychiatric disorders and addictions were responsible for 7.4% of all Disability-Adjusted Life Years (DALYs) worldwide [4]. They were also the leading causes of Years Lost to Disability (YLDs). And things are getting worse – the burden of psychiatric and substance abuse conditions grew substantially by over one-third in the 20 years following 1990. This increase may be associated with a population that is growing in both numbers and age [4].

Neuropsychiatric disorders of the type described above are examples of stress-related, chronic NCDs. The WEF reports that the financial expense of neuropsychiatric diseases was approximately 2.5 trillion dollars in 2010. They went on to project an increase to over six trillion dollars by the year 2030. The scope of this problem becomes clear when it is recalled that the world spent a total of 5.1 trillion dollars on all of health care in 2009. Moreover, all of US foreign developmental aid funding amounted to less than two trillion dollars over the last two decades [3].

Where does spending for neuropsychiatric disorders fit into this picture of the world's disease burden? It turns out that they demand the greatest resources while causing the greatest disability [3,4]. In other words, they are more expensive than the other NCDs. Indeed, it is suggested that they will be responsible for over one-third of the world's lost output over the next two decades. Considering the extensive co-morbidities that neuropsychiatric and addictive disorders share with other NCDs, it is likely that these attributed costs are underestimates. In the US, our third-party payers tell us that the non-behavioral health care costs of their enrollees who have behavioral health problems is much higher than in those of enrollees without mental illness. In other words, the cancer care costs of cancer patients who have behavioral health problems are many times higher on average than in similar patients without a behavioral health problem.

With these considerations in mind, what steps can be taken to deal with the drivers of NCDs, such as adverse childhood events resulting in the toxic stress of childhood and a lifetime vulnerability to NCDs? [5] How does the revolution in our understanding of epigenetics inform our approach to health and illness across the lifespan? What is the role of poverty and other social determinants in the development of toxic childhood stress and downstream NCDs? How does neurogenic neuroinflammation and the inflammatory response syndrome in general unite our understanding of communicable and non-communicable diseases, perhaps causing us to rethink whether all diseases are “communicable”? What is the role of stress-related mental illnesses such as highly prevalent depression and anxiety in the initiation and persistence of other co-morbid chronic stress-related NCDs? What kind of integrated, multi-system framework and shared delivery infrastructure for global health care delivery and evaluation can be constructed in resource-poor settings to begin to address the enormous challenge of mental illnesses embedded in the common pathogenesis of the chronic stress-related NCDs in an effective yet efficient way? This is indeed an exciting time to be involved in basic medical research. This work should lead the way to a proactive rather than reactive medical model that embraces prediction, prevention, personalization, and participation in the integrative medicine health continuum [6].

Conclusions

Until we learn more about the causal links between the experience of chronic stress and the subsequent metabolic wear and tear that takes its toll on brain and body and results in NCD vulnerability, we will have difficulty making progress. As editor of MSMBR, I hope to focus on how basic research aimed

at every system level can illuminate the mind-body integrative health continuum. We hope that this new knowledge can then be translated into innovative primary, secondary, and tertiary prevention strategies, as well as improved management of NCDs. In the process, we may help advance our ability to nurture a healthier world.

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