Convergence of chronic and infectious diseases: a new direction in public health policy

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Received: 8 May 2019 / Accepted: 20 May 2019 / Published online: 28 May 2019
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Dear Editor,

Non-communicable chronic diseases such as diabetes, cardiovascular diseases (CVD), and cancers are leading causes of morbidity and mortality in many areas of the world, but they also coexist with endemic infectious diseases such as tuberculosis, hepatitis, HIV, and vector-borne diseases. Adverse synergistic and etiologically bidirectional interactions between chronic and infectious diseases have been noted (O'Connor et al. 2006). A number of infectious agents have been identified as causal of chronic diseases (O'Connor et al. 2006). Examples include the role of schistosomiasis in bladder cancer, human papillomaviruses in cervical cancer, and hepatitis viruses in liver disease, hepatocellular carcinoma, and CVD (O'Connor et al. 2006; Badawi et al. 2018a). These associations were identified and studied from epidemiological, pathological, and molecular standpoints to ascertain the chronic sequelae of infection. More recently, however, evidence has emerged that chronic diseases are risk factors in the susceptibility to, and severity of, infections. For example, diabetic patients are disposed to urinary tract, skin, and lung infections (Benfield et al. 2007) and can be at two- to four-fold higher risk of severe outcome of flavivirus infections (Badawi et al. 2018b).

The objective of this letter is to highlight the need for evidence-based knowledge and information on the convergence between chronic and infectious diseases through assessing

common risk factors and population vulnerability. This would facilitate a holistic approach to develop public health policies and action for risk assessment, surveillance, health promotion, patient follow-up, and prevention that can better protect and enhance population health from the dual burden of infectious and chronic diseases. The changing age structure in many world regions accompanied by increased rates of chronic diseases together with the high background rates of infections have led the World Health Organization to identify the need for holistic responses to illness. This concept has guided the Millennium Development Goals of the WHO and is institutionalized in the collection of data across the disease spectrum within the Global Burden of Disease study (Fullman et al. 2017). Despite these steps, the convergence of the two disease conditions has yet to be addressed from a public health perspective. This is a new challenge that holds the potential to develop new policies, strategies, and practices that combine activities in infectious and chronic diseases into core public health functions of assessing risk, surveillance, health promotion, and prevention to better protect population health.

Our current understanding of how, where, and when chronic and infectious diseases converge to impact the public is rudimentary. For example, the effect of diabetes or obesity on the activation of latent tuberculosis was identified over a decade ago, but knowledge of the mechanisms, which would permit effective preventive measures, have yet to be elucidated (Dyck et al. 2007). Similarly, the role of hepatitis C virus infection in the risk of CVD has been proposed, but how this interaction is facilitated is still controversial (Badawi et al. 2018a; Petta et al. 2016). Our fragmented knowledge on population vulnerability to combined impacts of chronic and infectious diseases and the risk factors mediating their interactions demands an innovative approach that permits more holistic public health policies and practices. This should encompass efforts to assess the modifiable and non-modifiable risk factors that underlie the interaction between infectious and chronic diseases. A systematic collection of data in surveillance systems on infectious and chronic comorbidities at both national and global levels is also essential. Furthermore,

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efforts are needed to link geographic, environmental, and socio-economic information in census initiatives that were not previously designed to allow such linkage (Roberts et al. 2017). The current lack of this knowledge limits our understanding of the two diseases' inter-relationship and diminishes the ability to generate information necessary for coordinated interventions. Developing these concepts will align knowledge on common and interlinked aetiologies, risk, and concurrent vulnerabilities for both disease conditions to ultimately enhance our capacity in public health risk assessment, surveillance, health promotion, and prevention and control.

Attention to two key areas would provide opportunities to better characterize high-risk groups for priority public health responses. First: identifying and quantifying chronic sequelae rather than just acute cases of infectious diseases to properly rank the priority of the latter for public health action. For example, recent recognition of debilitating chronic disease outcomes of flaviviral infections (Badawi et al. 2018b) suggests that the public health impact of the latter is much greater than has been considered to date. Second: assessing and evaluating the role of chronic diseases in infectious disease pathogenesis and defining where, when, and how determinants of chronic diseases and exposure to infectious conditions intersect to render populations at particularly high risk. For example, tuberculosis and diabetes converge in Northern communities where multiple socio-economic, demographic, environmental, and host-related factors combine to influence the interaction of the two disease conditions (Dyck et al. 2007).

The development of a holistic public health program on chronic and infectious diseases is essential to better protect population health by effectively targeting and monitoring populations vulnerable to both diseases (alone and combined). Ultimately, this combined holistic public health program will lead to improved risk assessment, surveillance, and prevention and control for infectious conditions known to be influenced or exacerbated by chronic comorbidities as well as chronic diseases resulting from infectious disorders.

Acknowledgements This work was supported by the Public Health Agency of Canada (PHAC). PHAC had no role in the preparation, review, or approval of the manuscript or in the decision to submit the manuscript for publication.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Disclaimer The findings and conclusions of this paper are those of the authors and do not necessarily represent the official position of the Public Health Agency of Canada.

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