

Introduction to Session I

Cancers Caused by Infections: Unequal Burdens

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Introduction

Many people are surprised to learn that cancer can be caused by an infection. There are seven major infectious agents for which there has been sufficient evidence from epidemiological, clinical, and biological studies to be classified as human carcinogens by expert panels of the International Agency for Research on Cancer. These are hepatitis B virus (1), hepatitis C virus (1), certain strains of the human papilloma virus (2), *Helicobacter pylori* (3), Epstein-Barr virus (4), human immunodeficiency virus type 1 (5), and human T-cell lymphotropic virus type I (5). In addition, the Kaposi's sarcoma herpesvirus (or HHV8) is classified as a probable human carcinogen (4).

In the United States, it is estimated that ~7% of our total cancer incidence is attributable to the effects of one or more of these agents (6). The incidence of these infection-associated cancers is generally higher among our minority and disadvantaged populations (7). This excess occurrence likely results from higher infection rates for agents that are transmitted under conditions of crowding or poor hygiene, such as *H. pylori*. It may be because of increased exposure to blood that is contaminated with agents such as hepatitis C, through reuse of needles for medical procedures or for drug use. It may be because of lack of adequate medical care, such as access to regular cervical screening with prompt follow-up care for abnormalities. Thus, for a variety of reasons, there is an unequal burden of infection-related cancers among our minority and poorer citizens. This is particularly true for cervical cancer caused by certain genital papilloma viruses, liver cancer caused by the hepatitis B and C viruses, and stomach cancer caused by *H. pylori*.

What are the characteristics of these infectious agents that can cause cancer? The one common feature is that each can become a chronic infection (8). It is really the persistence, chronic expression, and replication of these agents that can, in some circumstances, lead to malignancy. There are also factors related to the individual carriers of these infections that can influence their probability of developing cancer. The most important factor is age of infection. That is a consistent theme

(8). Usually, very early age of infection is associated with subsequent risk of cancer. In addition, factors such as coinfections or nutritional state that affect the competency of the immune system can modify the risk of malignancy. How common are these infections? Some of these are fairly common; e.g., the majority of women have been or are currently infected with a high-risk strain of human papilloma virus. Does it mean that if I have one of these infections, I am likely to develop cancer from it? The answer is "No"; cancer is really a rare outcome of these infections. Except for the AIDS virus, most carriers of these infections are unaware of their infection and unlikely to experience any serious related illness.

There are also steps along the way where the infection can be prevented or cured. The best prevention is to avoid exposure itself, e.g., by avoiding any contact with blood from another person that might contain viruses with the potential to increase cancer risk. We now have a vaccination against Hepatitis B virus; my grandchildren are all vaccinated. *H. pylori* infection can be cured in many cases. The most important medical self-care action for prevention of cervical cancer is to have regular cervical screening.

Taken together, there are a variety of strategies that can be used at the individual or community level to reduce the burden from these malignancies. Today, we are going to talk about four of these infections and their impact on the cancer burden on minority and disadvantaged populations.

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