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Short Commentry

Prevention in Public Health: A New Look

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Prevention is the single most important topic in public health that by nature is highly complex and multifaceted in both concept and execution. It is a major objective in a wide spectrum of activities in a society from law enforcement to advanced medical practices, and usually gains prominence over other activities at the time of epidemics and spread of various diseases and human afflictions. The construct of preventive activities is deeply associated with the nature and levels of the disease and covers various actions from development and enforcement of common laws to preservation of safe environment, and practices of different levels of medicine for maintenance of the health and wellbeing of the population and its individual members from birth to final days. The earliest note on the complexity of this concept was provided by Rosen in 1975 in the context of disease prevention [1]. According to him, the first steps towards prevention were rooted in the Greco-Roman philosophy of health and visualized disease as the imbalance of the state of the body due to interactions of institutional "natural" factors like age and sex, with that of environmental "non-natural" factors like food, drink, exercise, and habitat. Efforts to prevent the occurrence of disease and maintaining the health and general wellbeing of people through modification of the nature and interaction between the non-natural and natural factors was labeled as "primary prevention". It included environmental sanitation as well as proper self-care and personal hygiene. In this context, "secondary prevention" covered all activities aimed at detection and treatment of the disease after its initiation and manifestation.

Over the years, the concept of prevention was further developed and in 1983, was recorded in the first edition of the Dictionary of Epidemiology in three major types of primary, secondary, and tertiary prevention [2]. Primary prevention was defined to include all activities aimed at protection of health by personal and community efforts like creation of a safe environment and maintenance of the natural state of life by proper nutrition, physical and emotional fitness, and immunization against infectious diseases. Secondary prevention was defined in terms of early detection and prompt treatment of affected individuals, while Tertiary prevention focused on rehabilitation and included all efforts aimed at reduction or elimination of long-term impairment and minimizing the limitations imposed by disabilities. In 2001 and in response to the prominence of non-infectious diseases, the concept of environmental action was officially accepted as a new type of prevention labeled as primordial and added to the original three types as Primordial prevention, increasing the types of prevention to four [3,4]. Later in 2008, a new type of prevention was introduced as quaternary prevention and was defined as actions that identify patients at risk of overdiagnosis or overmedication and that protect them from excessive medical intervention [5].

Various types of prevention are not independent of each other but are related in a hierarchal setting where each type follows the partial failure of the previous. This hierarchal nature of preventive activities was first suggested in 1979 [6] that divided prevention activities into four levels by breaking primary prevention into two distinct levels of environmental activities for creation of safe environment (Level I), personal protective activities (Level II), therapeutic activities (level III), and rehabilitation (level IV).

Types of prevention while distinct in method and approach and generally run alongside each other under diverse conditions, are in fact related in a hierarchal pyramid at various levels, each of which begins with the failure of the previous level, covers a smaller group of people, and is more specific at a significantly higher per capita cost.

The intensity and effectiveness of activities recommended for each level of prevention is highly dependent on the nature of the target disease and the status of the involved communities and may vary by location. In a recent major review of the global approach to health promotion and harm reduction, the scope of secondary prevention was limited to early detection of subclinical cases, while medical treatment of patients and rehabilitation was

lumped into the category of tertiary prevention [7]. Under a different approach, disease mongering, overdiagnosis and overmedication that can be considered as a logical part of patient treatment or secondary prevention, is separately defined as quaternary prevention [8].

Considering that the object of prevention is to stop the transition of individual from one status to a more distressing situation, and that efforts aimed at various types of prevention by necessity cover a wide spectrum of actions, the following stepwise visualization of the hierarchy of preventive concepts and actions is suggested, figure 1. This pyramid presents five distinct levels of attention and activity, each follows the failure of the previous level and covers a smaller population, requiring more complex and costly actions. Nevertheless, intelligent use of appropriate procedures at each level can have a significant impact on the wellbeing of the community by increasing productivity and happiness, as well as reducing the economic and manpower burden.

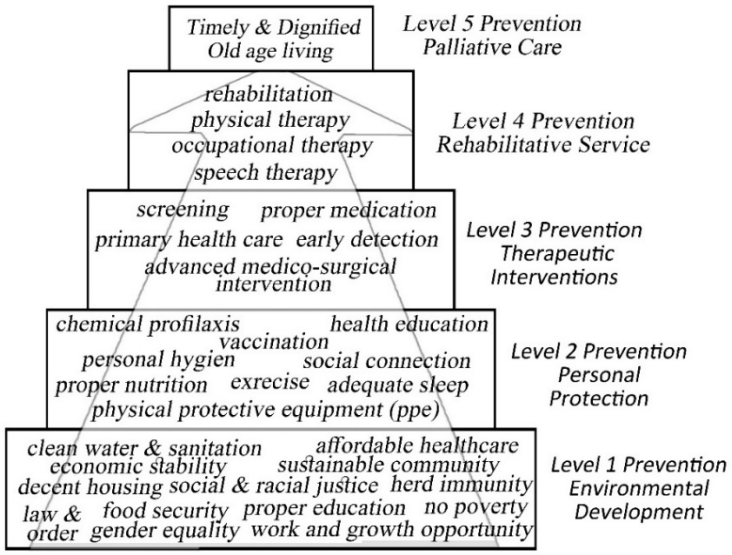

Figure 1: *The five-step pyramid of prevention*

Level 1 Prevention (Primordial)

The objective of this level of prevention is to create a safe environment in which exposure to infectious agents or circumstances that are causally associated with chronic and non-communicable diseases are eliminated or minimized. A few examples of this level of prevention are environmental sanitation, pollution control, developing and enforcement of laws to reduce or eliminate major risk factors for various non-infectious diseases, gun control, maintenance and enhancement of healthy food supply, and provision of economic solvency for the public. Other elements of this level of prevention include public education, control of illegal substances, and maintenance of herd immunity to prevent expansion of infectious diseases.

Level 2 Prevention (Primary)

This level includes all interventions that are focused on protecting apparently healthy individuals who are in an unsafe environment and at risk of exposure to disease causing agents and elements. Clearly, the need for personal prevention is due to the failure of Level I prevention in maintaining a healthy environment. Travelers to areas with poor basic sanitation or rampant endemic diseases are advised to follow certain protocols to protect themselves. A well-known example is chemoprophylaxis or temporary use of medication, like anti-malarial drugs when travelling to areas with high level of malaria endemicity. Vaccination, chemoprophylaxis, use of physical protection, adoption of personal protective behavior, and health education are the main elements included in this level. Vaccination and creating immunity against agents of infectious diseases, as well as health education and behavior modification for those at high risk of non-infectious and chronic diseases are the most significant tool in this level.

Level 3 Prevention (Diagnosis and treatment)

This level of prevention generally follows the failure of the protective efforts during the previous level. It covers diagnosis and treatment of disease. It begins with screening and early detection of subclinical disease cases and continues to cover all the therapeutic activities from simple office visits to complex surgical procedures and intensive care. Cancers and a few other chronic and psychological disorders are amenable to screening and

early detection during the subclinical stages, while most infectious diseases are diagnosed during their clinical phase. Nevertheless, all activities at this level of prevention are by nature tailored to the needs and circumstances of affected individuals at a rather skewed distribution and high cost.

Level 4 Prevention (Rehabilitation)

This level of prevention includes all efforts directed at reviving or compensating the functionalities that the patient has lost because of a disease or professional and occupational accidents. These services cover two major activities of reviving the lost capabilities such as walking or talking after a stroke or replacing the lost activities by providing new capabilities like prosthetics and artificial limb or arm. The number of people covered at this level is much smaller and the cost much higher than those diagnosed and treated at the previous level.

Level 5 Prevention (Support and Palliative care)

This level of prevention covers individuals who need additional organized care services outside the hospital or their home setting that is generally provided at nursing homes; or palliative services for those who are at the stages of disease with no therapeutic or rehabilitative prospect, the kind of services and care provided under hospice setting. Do Not Resuscitate (DNR) orders are a significant element at this level that includes activities aimed at reducing the distress and agony of incapability for self-support and the physical and mental suffering of the final days of life.

As an example, consider poliomyelitis, an infectious disease that does not have a cure and is only managed through prevention and palliative treatment. The natural progress of polio covers all levels of prevention. Level I is provision and maintenance of clean water and proper disposal of wastewater which are basically non-medical activities. Level II covers vaccination against the disease and behavior modification for self-protection and sanitation. Level III is early detection and proper treatment to provide relief of symptoms, speedy recovery of symptoms, and prevent complications. Levels IV and V cover rehabilitative and palliative services like wheelchair and iron lungs for those affected with the aftermaths of this disease. With a combination of environmental sanitation and effective vaccination programs and full spectrum of preventive actions, this disease with the annual incidence rate of 13.8 per 100,000 in the US in 1954 , was eliminated in the American region by 1994 [9,10]. Globally, this disease that caused over 350,000 cases in 1988 [11], is now on its way toward eradication with only six cases in 2021 [12].

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