Infection and intelligence

Prof Shima Gyoh thinks evidence of the correlation between infection and intelligence should inform governments of the absolute priority to raise citizenry out of poverty

Are infectious diseases sapping people's brainpower in the world's poorest countries? A well-researched work by Christopher Eppig et al[1] suggests this is so. They adduce evidence that repeated heavy infection and infestation afflicting growing children constitutes a most powerful factor in compromising their intelligence.

Facts about the human brain sound like fiction. Weighing 1.4 kg on average, it contains about 100 billion neurons. Their important companion cells, called neuroglia, outnumber the neurons ten to one. Each neuron makes thousands of connections with the others through tiny innumerable junctions called synapses. Our brains form around a million new connections every second of our lives and utilise 20% of the energy consumed by the adult body at rest.

It is calculated that the neurons multiply at the rate of 250 000 per minute in early pregnancy. With regard to size, the human baby is nearly all brain at birth; the body takes years to catch up. After birth, the skull remains open first through membranes and later cartilage where its various plates meet to allow for further rapid expansion of the brain, especially in the first 3 years. It is logical to assume that shortage of protein and other nutrients so common in developing countries, especially at the time of weaning, would somehow adversely affect the development of the brain and perhaps result in lower intelligence as suggested by Eppig and his co-workers.

The studies of Holliday in 1986[2] showed that, at birth, about 87% of the energy a baby uses goes to power the development of the brain alone. This proportion gradually drops as the body catches up, but at the age of 5, it is still at the high level of 44%. However, in the first 5 years in developing countries, the infant is bombarded by all sorts of life-threatening infections, infestations, and diarrhoeal diseases, and many do not survive. These require a lot of energy to fight, and the body diverts a huge proportion of available energy to combat the onslaught. The welcome by-product is the the fact that the body acquires the ability to handle a wide spectrum of antigens, decreasing the episodes of abnormal reaction to environmental and endogenous antigenic challenge, such as asthma and auto-allergic diseases.[3] The cost, however, may be enormous, as the brain may have to cope with less energy than ideal for optimum development at such sensitive times. Does this result in an overall reduction of cognitive ability?

Intelligence may be impossible to measure in absolute terms applicable to all cultures, but for each society comparative methods (e.g. WAM, LVE, LVCD, AVED) have been designed to measure the IQ (intelligence quotient) and the results give a reasonable yardstick for comparing human cognitive abilities in particular environments. This subject tends to be sensitive, as it has been misused to justify oppression at various times in human history. However, it is too important to ignore, and the conclusions reached by Eppig and his colleagues have enormous implications for developing countries.

Taking the average intelligence from the 2006 work of Vanhamen,[4] they directly measured the IQ in 113 nations using the LVE and the WEAM methods, estimated it for 79 countries and then did sample measurements in the estimated countries for validation. They plotted the national average IQ against infectious disease burden calculated from DALY (disability adjusted life years) lost using World Health Organization records.

Among the numerous conditions suspected to affect human cognitive ability, the ones used in this study were: education, protein–energy malnutrition, income per capita, average high winter temperatures (as cold environments are said to be more challenging to life), distance from Central Africa (on the assumption that the more intelligent members of a tribe were more likely to wander further from the starting point of human migration). Correlation with infectious diseases was very strong, and was in fact the underlying cause of association in practically all the other factors. This is supported by the Flynn effect which describes the large increases in IQ that occur within a few generations as an epigenetic effect of economic development.

Most of us that live in this region might have assigned the frequently observed difficulties of mental grasp afflicting the less fortunate members of our society to lack of education, but elimination of the influence of infection surprisingly makes education alone insignificant. Raising the standard of living of the average citizen within the shortest time possible should be the unchallenged priority in the developing world, particularly in Africa where our governments should worry that a slow pace of emergence from poverty, ignorance, and the infective stage of national development might compound our countries' challenges in the most painful way – lowering of the average national intelligence.

Prof Shima Gyoh has held many posts ranging from village doctor to DG of Nigeria's Federal Ministry of Health and Chair of the Medical and Dental Council of Nigeria.

References

1. Eppig C, Fincher CL, Thornhill R. Parasite prevalence and the worldwide distribution of cognitive ability. *Proc R Soc B* 2010; 277: 3801–8.
2. Falkner F, Tanner JM, Holliday MA. 1986: Body composition and energy needs during growth. In *Human growth: a comprehensive treatise*, Vol. 2. Eds Falkner F, Tanner JM. New York: Plenum; pp. 101–17.
3. Gyoh S. Killing bacteria for a sterile environment. *Afr Health* 2012; 34: 5.
4. Lynn R, Vanhamen T. National IQ and economic development: a study of eighty-one nations. *Mankind Quart* 2001; 41: 415–35.