

“The Thousand Days That Make a Healthy Life”: Progress in Infant Nutrition and Public Health in the Asia Pacific Region

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Abstract: During the past 50 years substantial progress has been made improving the health and wellbeing citizens of all ages in our region, but particularly of infants and children. Fifty years ago infant mortality was around 130 per 1,000 live births in the East Asia and Western Pacific Regions and it was even higher in some remote areas. Infant mortality in the region now averages 17 and is as low as 3 in Japan and Korea, and improvement is substantially due to improved nutrition. However as the region is now facing an epidemic of chronic disease, prevention will require continued emphasis on nutrition during the first 1,000 days of life and particularly on breastfeeding.

Key words: Infant Nutrition, Breastfeeding, Infant mortality, Health outcomes, DOHaD (Developmental Origins of Health and Disease)

The first 1,000 days of life incorporates the time period from conception until two years of age. During this period nutrition has an immediate impact on health and survival, but also programs health trajectory for a lifetime^{1, 2)}. Early healthy nutrition, particularly exclusive breastfeeding is related to lower rates of infection and survival and then later health. Nutrition during the first 1,000 days is particularly important because of its effects on the development of chronic disease in middle aged adults.

During the past 50 years substantial progress has been made in improving the health and well-being of citizens of all ages in our region, but particularly of infants and children. Fifty years ago infant mortality was around 130 per 1,000 live births in the East Asia and Western Pacific Regions and in some remote areas was even higher. Infant mortality in the region now averages 17 and is as low as 3 in Japan and Korea, and yet remains above 50 in some remote areas including Papua New Guinea providing continuing public health challenges. In the Peoples Republic of China, the largest country in region, the infant mortality rate has dropped from 42 to 12 in the past two decades³⁾. During the past 50 years the average life expectancy in the region has increased from 50 years to 73 years, and is as high as 83 in

Japan, 81 in Korea and 76 in China. These are dramatic changes that are greater than in any other WHO region³⁾ and are due to the combined influences of improved public health, health services, education and nutrition.

In the 1960s research on the interactions between nutrition and infection led to a realisation of the importance of improved nutrition to protect infants from infections. In a landmark WHO monograph published 47 years ago, Scrimshaw, Taylor and Gordon summarised available knowledge on the interaction of nutrition and infection⁴⁾. This monograph documented the fact that children suffering from undernutrition had a greatly increased rate of infections and death. The importance of breastfeeding in infant survival was described “the fate of newborn infants in many pre-industrial areas seems to depend largely on whether they are breastfed or not-either they are nursed or they die”⁴⁾. This statement reflects the importance of breastmilk in the provision of bioavailable nutrients and energy and the protective factors against infection. The publication of this monograph led to the implementation of a large number of nutrition programs, the widespread promotion of maternal and child health clinics and increased research into the causes and consequences

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of poor nutrition in different cultures.

An example of many studies published in this period was a cohort study of one thousand children (aged 1-4 years) in a remote area of the Highlands of Papua New Guinea⁵). Here the incidence of diarrhoeal disease was almost double in children who were under nourished compared to those whose growth was in the normal range. The risk ratio for diarrhoeal disease was 1.6 and for lower respiratory infection was 1.75. One of the limiting factors of child nutrition in this population was the high volume (low nutrient density) of the complementary foods used⁵). This continues to be a major problem in many cultures, particularly in low income countries, as complementary foods are often of low nutrient density and based on available starchy staples, including rice, maize and sweet potato⁶).

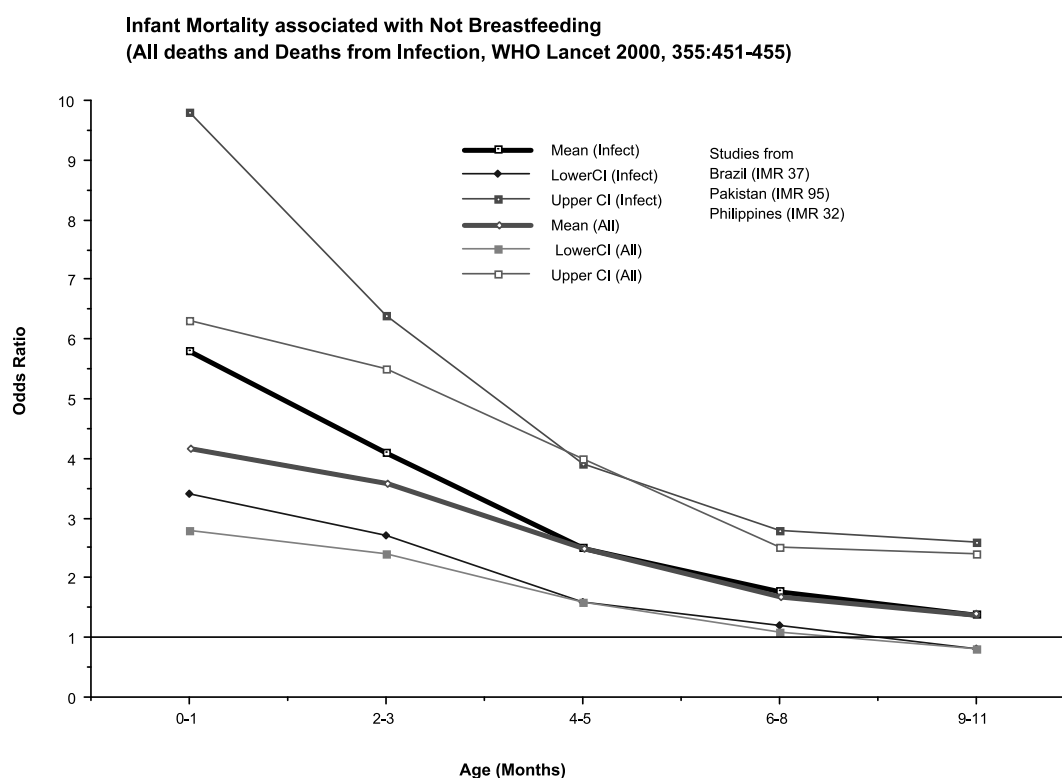
The importance of breastfeeding in protection against infection and death was also highlighted in the WHO Collaborative Group study which pooled data from eight countries in three continents⁷). The study found that in developing countries infants who were not breastfed had a greatly increased probability of dying from infection and all causes. The data from the study has been plotted in Figure One to illustrate the odds ratio of dying when infants are not breastfed.

US Surgeon General's Reports

Fifty years ago (1964) the first Surgeon General's Report on Smoking and Health was published⁸). The report reviewed and summarised 7,000 publications on the current state of knowledge about the medical and public health impacts of smoking. It signalled the beginning of concerted public health action against smoking in many countries. Programs that commenced following its release are estimated to have saved the lives of 8 million Americans and reduced the smoking rate from as high as two thirds of adult males down to 18% in the USA and 15% in Australia⁹⁻¹¹). Despite the decline in smoking in many western countries the Asia Pacific region contains more than 30% of the world's smokers and it remains a major public health challenge. This report was the forerunner of many reports that have made a global impact on public health.

In 2011 the US Surgeon General released a report on breastfeeding, the "Surgeon General's Call to Action to Support Breastfeeding"¹²). This is an important report as it is the first time that a national authority has documented the hazards of using artificial infant formula. It is to be hoped that this report will have just as important public health impact as the smoking report. The increased risks to

Figure One.



health resulting from not breastfeeding documented in the report are shown in the table above (See Table One)

Since the Surgeon General's Report further studies and reviews have reinforced the importance of infant feeding on long term health. In a large prospective cohort study of 5,000 children from the Netherlands, de Jonge observed differences in cardiovascular development between breastfed and never-breastfed children. Also children who were of younger age when solid foods were first introduced (before 5 months) had a higher blood pressure^{13, 14)}. In their review of previous studies they also noted that breastfeeding duration was inversely associated with blood pressure, obesity, cholesterol concentrations, and insulin resistance, results that are consistent with the Surgeon General's conclusions.

In a further review of the literature Golley found that the early introduction of solid foods and the delayed introduction of textured food were associated with poorer diets and obesity in later life. Sodium and fat intake in the first year of life were also positively associated with childhood blood pressure and blood lipids¹⁵⁾. Using data from the Avon Longitudinal Study in the United Kingdom they found that the use of appropriate complementary foods and their timing was associated with a "health conscious" dietary pattern at seven years of age and IQ scores and there was a weaker association with diastolic blood pressure¹⁵⁾.

DOHaD

Prof. David Barker did more than anyone else to promote the Developmental Origins of Health and Disease hypothesis and so it is appropriate that one of his last papers before his untimely death described the links between early feeding and later health¹⁶⁾. It was from Hereford that Barker published his original data linking birthweight and coronary heart disease¹⁷⁾. Since then evidence has accumulated that environmental influences acting in early development are linked to later health including early postnatal nutrition. Cohort studies have shown that breastfeeding is associated with small reductions in blood pressure and serum cholesterol in adult life and with a lower risk of becoming overweight and developing type 2 diabetes¹⁶⁾. The limitations of this data is that the composition of

Table One. Increased risks to health from not breastfeeding (percentages)

<i>Among full-term infants</i>	
Acute ear infection (otitis media)	100
Eczema (atopic dermatitis)	47
Diarrhoea and vomiting (gastrointestinal infection)	178
Hospitalisation for lower respiratory tract diseases in the first year	257
Asthma, with family history	67
Asthma, no family history	35
Childhood obesity	32
Type 2 diabetes mellitus	64
Acute lymphocytic leukaemia	23
Acute myelogenous leukaemia	18
SIDS	56
<i>Among preterm infants</i>	
Necrotising enterocolitis	138
<i>Among mothers</i>	
Breast cancer	4
Ovarian cancer	27

* The excess risk is approximated using odds ratios.

Source: Adapted from US Department of Human Services 2011¹²⁾.

infant formula has changed since the inception of the cohort and the age at introduction of solid foods at that time was much later in infancy, and weaning may have been more gradual than it is today. As a result, milk was a relatively greater part of an infant's diet. But even after allowing for these limitations, the Hereford cohort data provide support for current infant feeding guidance to breastfeed, and to provide a varied weaning diet based on fruit, vegetables and home-prepared food. Appropriate infant feeding is important not only to support early growth and development, but may also be involved in establishing good food habits in later life¹⁶⁾.

In a recent review of the DOHaD (Developmental Origins of Health and Disease) hypothesis, Paliy notes that the rates of child and adult obesity have increased in almost all countries in recent decades, and this will in turn affect chronic disease rates in adults. The early life factors associated with the development of obesity include higher birth weights and increased weight gain during pregnancy. In turn, mother's excess body weight during and after pregnancy can be linked to the risk to infant overweight and obesity through dietary habits, mode of delivery and feeding, breast milk composition, and through the influence on infant gut microbiota, initiating an intergenerational cycle of obesity¹⁸⁾.

The implications of this research are that infant nutrition has become an even higher priority for public health and nutrition. Most national nutrition

guidelines reflect the fact that the best health and nutrition outcomes are achieved in infants who are exclusively breastfed until six months of age and who then continue to be breastfed while complementary feeds are introduced. However this is rarely achieved in our region as shown in a recent review¹⁹⁾. Our research group has undertaken 20 cohort studies in Asia of risk factors that determine the quality and duration of breastfeeding, using consistent definitions and questionnaires that highlight problems with data collected retrospectively^{19, 20)}. The questionnaires were based on the Perth Infant Feeding Study with changes made to accommodate local cultures²¹⁾. Rates of exclusive breastfeeding in our region are below optimum, often a consequence of the widespread and increasing use of prelacteal feeds. Prelacteal feeds are as high as 90% in some areas of China²²⁾.

Smoking is the most important modifiable risk factor for human disease and smoking by mothers and/or fathers decreases breastfeeding initiation and duration in all of the cultures studied²³⁾. The rates of caesarean section delivery vary across Asia, but are often high, and high rates (80%) are related to lower rates of breastfeeding²⁴⁾. In all of the cultures studied the support of the father and the baby's grandparents had a positive effect on breastfeeding outcomes. Other important factors in breastfeeding are birth weight of the infants, breastfeeding difficulties, early return to paid employment and inadequate health staff education. The rate of ovarian cancer is reduced in mothers who breastfeed their infants, with reductions proportional to the total months of breastfeeding. Public health policies and health promotion that emphasise the importance of breastfeeding will be important in modifying the increasing incidence of chronic disease. More and more evidence is accumulating of the importance of good nutrition in the first 1,000 days of life to maintain health throughout the human lifespan.

Conclusion

There have been dramatic improvements in the health of the Asian and Western Pacific Regions in the past 50 years. Studies on infant nutrition have contributed substantially to this improvement. The best health and nutrition outcomes are achieved in infants who are exclusively breastfed until six months of age and who then continue to be breastfed while complementary feeds are introduced.

Now the region faces new challenges of chronic disease. Appropriate early nutrition, especially

breastfeeding to around six months and then while complementary foods are introduced, will improve health both in infancy and throughout the whole life course.

Author Disclosures

The authors have no disclosures to make.

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