

PERINATAL LESSONS FROM THE PAST

Arvo Ylppö (1887–1992): pioneer of Finnish paediatrics

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Besides developing the clinical and social care of children throughout Finland from 1920 onwards, the earlier research of Ylppö in Germany had laid the foundations world wide for scientific progress in the understanding and care of the premature infant.

Before returning to Finland in 1920, Ylppö published three classic monographs in 1919 on the physiology, growth, clinical findings, pathology, mortality, and outcome of premature infants.^{3–5} His observations were based on the study of several hundred premature infants, as well as on some 600 postmortem examinations. His studies included the histopathology of neonatal pulmonary haemorrhage, respiratory distress syndrome, and congenital heart disease. Ylppö's research provided the groundwork for the future scientific study of newborn infants and in particular the care and disorders of the premature infant.

Arvo Henrik Ylppö was born in 1887 in Akaa in a rural part of central Finland, at that time part of Russia. His parents were farmers and he was the 5th of their 12 children. Born prematurely, he remained of small stature throughout his life (fig 1). As a lad, his most impressive qualities included "curiosity, thirst for knowledge, a friendly, teasing humour, endurance and human sympathy".¹ From an early age he determined to become a paediatrician, perhaps because of his mother's anxiety over the illnesses of her many children. In 1906 he entered the University of Helsinki and studied medicine there and also later in Göttingen. At the same time he took every opportunity of travelling widely in Europe and the Near-East to study the cultures of other peoples as well as their medical problems. In March 1914 he graduated Doctor of Medicine and Surgery in the University of Helsinki. The same year he obtained a PhD based on the bilirubin metabolism of infants. Using dogs, he was the first to demonstrate the enterohepatic circulation of bilirubin. He also made a number of valuable observations on icterus neonatorum. Congenital obliteration of the bile ducts he considered to be due to a failure of recanalisation.²

Between 1912 and 1920, Ylppö undertook predoctoral and postdoctoral studies at the Kaiserin Auguste Victoria Haus in Berlin. This hospital had been founded by the German Empress, Queen Victoria's eldest daughter, in order to combat high infant mortality. As Ballowitz has written:¹ "From there originated the ground-work of his productive research. Studies on prematurity and on jaundice in the newborn were his main topics. In addition, he investigated many other paediatric problems. His command of various laboratory as well as patho-anatomical methods was astonishing but he always remained a physician close to his patients. The smallest prematures were often attended by him personally. He fed them for hours, drop by drop. By this meticulous care he obtained—without incubators, respirators or antibiotics—the world's best survival rate at that time. In the same institution, Kaiserin Auguste Victoria Haus, premature mortality could not be further improved until 1972".

Birth weight and length for gestational age

Most of all, Ylppö is remembered for his studies on prenatal and postnatal growth which led to the concept of birth weight and length for gestational age. He replaced the philosophy of "congenital weaklings" with that of "premature infants", defined as those with a birth weight of 2500 g or less.⁴ Noting great variations in growth he wrote:

"Thus even in fetal life we have to deal with infants who may be thin and long or broad and short ... we have so far no reliable growth

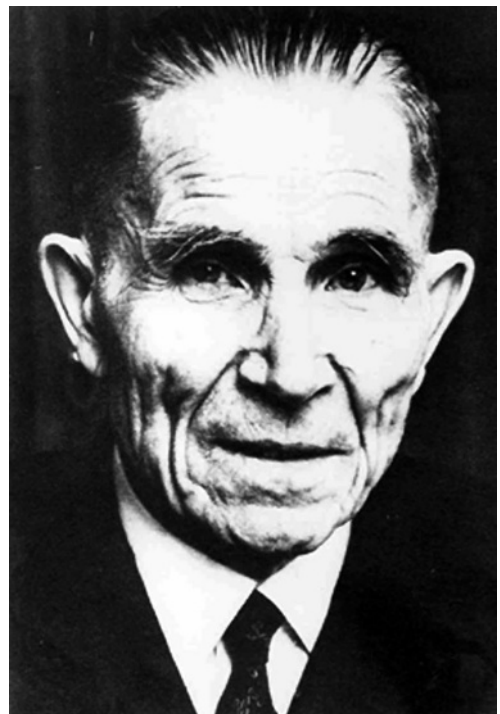


Figure 1 Arvo Ylppö, MD (1887–1992).

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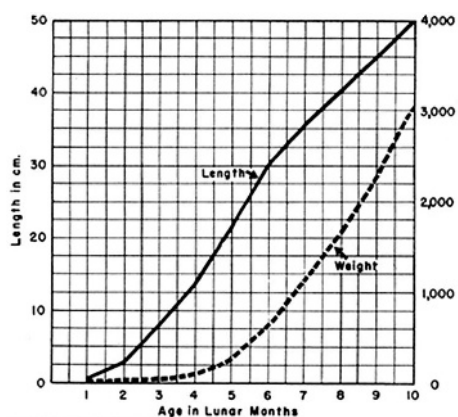


Figure 2 Ylppö's growth curves for fetal length and weight in 1919.⁴

curves for intrauterine life ... As could be expected, the answers to the question how much a human fetus must weigh at a given age differ even more than the figures for the average length; for the first 5 months the figures are particularly unreliable. Fortunately this circumstance is not very important for us because we wish to obtain reliable average figures for viable premature infants, and these are not present among fetuses less than 5 months old. For the subsequent months of pregnancy the material is much more abundant and the figures are more reliable; but here too great differences have been observed among the averages given by the different writers."

Ylppö set about collecting data that enabled him to construct his own fetal growth curves (fig 2).⁴ In his study of the growth of some 700 premature infants, nearly half of whom died before the end of the first year, he compared the growth of the premature infant with his intrauterine growth curve and with figures for the growth of the full term infant. He wrote:⁴

"The normal growth impulse in premature infants is enormous ... and the younger the child [in gestational age] the more intense is the growth. We must not, however, on this account deceive ourselves when, for instance, the weight curve of a premature infant rises; this by no means signifies that the weight is increasing sufficiently. In evaluating the increase in weight and growth in general we must use different standards in each case, according to the individual's [gestational] age. The so-called increased growth potential of premature infants ... is nothing more than an expression of the impulse of premature infants to follow the laws of growth corresponding to their [gestational] age".

In 1955 Ethel Dunham wrote:⁶ "Ylppö concluded that in premature infants the laws of growth were temporarily interfered with by factors due to the prematurity. Almost all of his group of premature infants showed disturbances of growth in both weight and length, which he considered to be the inevitable consequence of premature birth ... Those weighing less than 1000 Gm took longer to overcome their handicap ... Though the smallest infants showed the most extreme retardation, all the premature infants studied except a few in the higher weight groups showed a retardation in growth that was not overcome for a considerable period. The disturbance in growth in Ylppö's series began immediately after birth and was proportionally greatest between the sixth and the twelfth postnatal month. In the conceptional age 2 to 4 years

the premature infants began to catch up to the norms, and most of them had done so at about the conceptional age of 5 or 6 years. From this period on the weight and length curves of the premature children corresponded with those of full-term children, except that the recovery of the smallest prematures (birth weight less than 1000 g) appeared not to be completed in this period. In spite of many individual differences, therefore, Ylppö regarded it as demonstrating that immaturity itself and the associated factors for which it was responsible have as their almost inevitable consequence this temporary deviation of premature infants from the laws of growth determined by each individual's heredity. He attributed this retardation primarily to under-nutrition and rickets and secondarily to infections, unsatisfactory functioning of the endocrine glands, and the inertness that deprives premature infants, especially the smaller ones, of the growth promoting stimulus of active movements". Ylppö's follow-up of his cohort of infants also revealed to him the price to be paid for premature delivery, not only in growth retardation, but in cerebral palsy, blindness, deafness and mental retardation.

On leaving Germany, Ylppö was awarded the Otto Heubner prize for 1920, while the certificate awarded by the director of the Kaiserin Auguste Victoria Haus, Professor Leo Langstein, read: "I am willing to prophesize for him a shining future in our area (of study) and hope that through him, many difficult problems in pediatrics can be solved. He has been a great help in our house (clinic), which we can hardly expect to get again. In rare combination, the clinician, the scientist and the human being in him have brought great benefit to the scientific reputation of our clinic." This prediction was fulfilled in Finland, which at the time of his return in 1920 had just gained independence from the Soviet Union. Up till that time, the care of the newborn and children had been mainly in the hands of obstetricians and surgeons. Ylppö, almost single handed, set about creating a paediatric specialty. As Leonore Ballowitz has written:¹ "As far as pediatrics was concerned, it was virtually non-existent and so he immediately personally undertook the project of improving child-health care. He stumped the country lecturing for mothers, nurses, midwives and doctors. With wax dolls and impressive pictures—showing rickets for instance—his audience was trained in the recognition of illnesses. Ylppö constructed and invented many new Finnish words to make medical expressions understood. Old prejudices, such as tight swaddling of babies, were cleared away. Against old-style Finnish habits, sunshine and fresh air came into the nurseries (even in winter). Breast feeding was propagated anew.

Sophie Mannerheim, the sister of Marshal C.G. Mannerheim, founded a League of Child Welfare and appointed Ylppö as chairman. This created a platform for his social and public health activities. The government began to support him. In the course of time, infant mortality and the quality of child health care centres in Finland were among the best in the world. Even housing projects with special regard to the needs of young children were included in the efforts."

In 1920 Ylppö had been appointed Chief of the Children's Castle Hospital in Helsinki, a post he then held for 43 years. He taught on children at the University of Helsinki from 1921, and was appointed professor of pediatrics there in 1925, and also head of the University Children's Hospital. These posts he held until his partial retirement in 1957 at the age of 70. Besides being an enthusiastic teacher, Ylppö maintained his interest in research, writing mainly on newborn care and especially on infant feeding and metabolism. At the age of 67 he made a particularly important contribution. In the early 1950s, on the advice of two Boston paediatricians, it had become common practice to starve premature infants for as long as 4 days after

birth in order to prevent vomiting and/or aspiration. In 1954 Ylppö wrote:⁷

On the early feeding of premature babies

“Both vomiting and edema which are the starting points for this hunger therapy are ambiguous phenomena attributable in their etiology to very many reasons. I do not consider them sufficiently justified premises for such a radical method of feeding as 2–4 days complete fast. I feel further that many premature infants continuously supplied during the fetal period with both food and plenty of water and growing rapidly must suffer in a special manner from a complete break in administration of fluid and food ... vomiting and edema cannot be prevented by complete fast; indeed on the basis of all that has been said I am of the opinion that we must try to arrange to feed the premature infant immediately after birth in conformity with nature and the conditions of the fetal period.”

How right he was! But in spite of Ylppö's advice some years were to pass before awareness of the complications of starvation, such as neonatal hypoglycaemia, led to the widespread reintroduction of early feeding.

In her 1985 tribute, Ballowitz has written of Ylppö's semi-retirement: “Well known is the kind hospitality and refreshing, simple, rural life on the Ylppö island “Alila” located in the Baltic Sea not far from Helsinki ... Even today Arvo Ylppö maintains friendships in many parts of the world. His letters go (in different languages) in clear handwriting. They always express his personal interest and usually they contain a message which brings a smile to the face of the recipient. Such is the nature of this wonderful man.” Many honours also came to him. He was awarded doctorates by the Universities of Königsberg, Giessen, Turku, and Tampere. He was made an honorary member of the European and International Pediatric Societies and of the paediatric

associations of Finland, Sweden, Norway, Denmark, Austria, Italy, Poland, and Great Britain. In 1952 the President of Finland made him “Archiater”, a special honour awarded to just one physician for life. In 1964 Ylppö was awarded the Rosen von Rosenstein medal of Sweden, and on his 70th birthday Finnish physicians instituted a prize carrying his name that was to be given every five years “for special achievements in the field of pediatrics, especially neonatology and prematurity”. After his death, a Finnish stamp portraying him was printed in celebration of his pioneering work on behalf of children.

In 1920 the infant mortality for Finland was 10%. By the time of Ylppö's death in 1992 at the age of 104 it had fallen to 0.6%, one of the lowest rates in the world.⁸ His influence on the development of paediatrics in Finland had made a major contribution to this achievement.

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