ORIGINAL ARTICLE

Increasing incidence of infantile hemangiomas (IH) over the past 35 years: Correlation with decreasing gestational age at birth and birth weight

Katelyn R. Anderson, MD,[a] Jennifer J. Schoch, MD,[a] Christine M. Lohse, MS,[c] Jennifer L. Hand, MD,[a,b,d] Dawn M. Davis, MD,[a,b] and Megha M. Tollefson, MD[a,b]
Rochester, Minnesota

Background: Infantile hemangiomas (IH) are the most common soft-tissue tumors of infancy, but little is known regarding their true incidence.

Objectives: We sought to determine the current incidence of IH and examine trends in incidence, demographics, and lesion characteristics over 3 decades.

Methods: The Rochester Epidemiology Project was used to identify infants residing in Olmsted County, Minnesota, who were given a diagnosis of IH between January 1, 1976, and December 31, 2010.

Results: In all, 999 infants were given a diagnosis of IH. Incidence increased over the 3-decade study period from 0.97 to 1.97 per 100 person-years ($P < .001$). Average gestational age at birth and birth weight for infants with IH decreased over the study period (39.2-38.3 weeks, $P < .001$ and 3383-3185 g, $P = .003$, respectively). The overall age- and sex-adjusted incidence of IH was 1.64 per 100 person-years (95% confidence interval 1.54-1.75).

Limitations: The population of Olmsted County, Minnesota, is predominantly non-Hispanic white, limiting our ability to report racial differences in incidence. This was a retrospective study.

Conclusions: This study provides a longitudinal, population-based incidence of IH. Incidence has increased steadily over the past 3 decades, correlating significantly with decreasing gestational age at birth and birth weight in affected infants. (J Am Acad Dermatol http://dx.doi.org/10.1016/j.jaad.2015.08.024.)

Key words: hemangioma; incidence; infantile hemangioma; vascular anomaly; vascular birthmark; vascular tumor.

Few reports of the true incidence of infantile hemangiomas (IH) exist, with prior estimates varying from 3% to 10%.[1,2] Although generally benign and self-limited, hemangiomas can lead to significant complications including disfigurement, pain, and functional impediment.[3]

Early estimates of incidence are difficult to interpret because of flaws in methodology, including referral bias, inadequate duration of follow-up, and inconsistency in classification of vascular birthmarks. Nomenclature of vascular anomalies became standardized only after Mulliken and Glowacki proposed a biological classification schema in 1982.[4]

The few studies published since the introduction of this classification vary in their estimates of incidence. An Australian study found the incidence to be 2.6%, but relied on reporting of IH by parents and followed up infants only through 6 weeks of age.[5] A US prospective study of 594 infants followed up through 9 months of age found the incidence to be 4.5%.[6] This study was limited by the low number of IH identified (27 infants), and reliance on

From the Departments of Dermatology,[a] Pediatric and Adolescent Medicine,[b] Biomedical Statistics and Informatics,[c] and Medical Genetics,[d] Mayo Clinic.
Drs Anderson and Schoch contributed equally in this research.
Funding sources: None.
Conflicts of interest: None declared.
Accepted for publication August 12, 2015.

Reprint requests: Megha M. Tollefson, MD, Mayo Clinic, 200 First St SW, Rochester, MN 55905. E-mail: Tollefson.Megha@mayo.edu.
Published online October 19, 2015.
0190-9622/$36.00

http://dx.doi.org/10.1016/j.jaad.2015.08.024

telephone follow-up and parental reporting to identify lesions that developed after birth.[6] A recent, large, cross-sectional study of the Dutch population found a prevalence of IH of 9.9% in children aged 0 to 16 months.[7] Practitioners were instructed on the use of Mulliken and Glowacki's classification of cutaneous vascular anomalies before diagnosis of these patients, thus providing an accurate estimate of prevalence of IH in this population. Although informative, prevalence cannot be directly compared with incidence.

Risk factors for the development of IH including female sex, white non-Hispanic race, prematurity, low birth weight, and multiple gestation have been well described.[1,7-10] Placental abnormalities, chorionic villus sampling, and amniocentesis have also been associated with IH.[6,7,9,11] Prematurity rates and associated complications have increased in the United States over the past decades, but how these changes relate to incidence of IH is unknown.

Our objective was to determine the current incidence of IH in Olmsted County, Minnesota, and trends in incidence, demographics, and phenotypic data related to IH over the past 3 decades.

CAPSULE SUMMARY

- Little is known regarding the true incidence of infantile hemangiomas.
- This study demonstrates an increasing population-based incidence of infantile hemangiomas over 3 decades.
- Characterizing incidence allows for determination of disease burden and guides efforts aimed at identifying infants at highest risk.

METHODS

Patient selection

In this institutional review board–approved study, the Rochester Epidemiology Project (REP) was used to identify 1547 children aged 0 to 3 years, who were residents of Olmsted County, Minnesota, at the time of diagnosis of "hemangioma skin" between January 1, 1976, and December 31, 2010. The REP is a medical records linkage system allowing for access to records for nearly all patient encounters in Olmsted County, Minnesota, since the 1960s. This resource provided a means to identify all diagnosed cases of IH in a geographically defined community, thus enabling accurate calculation of incidence. The potential for the REP database to be used in a population-based study has been previously described.[12]

A review of each medical record was performed by the primary authors. Diagnosis of IH was determined to be accurate if the lesion demonstrated characteristic morphology via reported physical examination findings and/or appropriate growth characteristics with initial growth out of proportion to the child, followed by slow involution. When available, photographs were reviewed. Lesions that were found to have a description or photograph inconsistent with a diagnosis of IH were excluded. Fifteen patients declined research authorization during the data-gathering phase of the study and were excluded. Those with diagnosis after age 1 year were excluded as they were less likely to have a lesion description and clinical course consistent with IH. Incidence date was defined by first physician diagnosis date.

Demographic data and maternal pregnancy complication(s) (if present) were extracted from the medical record. Pregnancy complications were defined as potentially pathologic processes associated with pregnancy documented in the infant's medical record, including, but not limited to: multiple gestation, diabetes/gestational diabetes, hypertension (pre-existing or pregnancy induced), preeclampsia/eclampsia, HELLP syndrome (hemolysis, elevated liver enzymes, low platelet count), maternal infection, substance abuse, and intrauterine growth restriction.

Extracted IH characteristics included type (superficial, deep, combined, or not specified), number, size at time of diagnosis, distribution (focal, multiple, segmental, or not specified), location(s), presence of associated syndromes, and complications. IH complications identified from review of the medical record included bleeding, ulceration, infection, disfigurement, visual axis obstruction, airway involvement, feeding impairment, or other functional impediment. For each patient, the date/age of diagnosis, age at referral (if present), and treatment method (if present) was identified.

Statistical methods

Continuous features were summarized with means, SDs, medians, and ranges; categorical features were summarized with frequency counts and percentages. Associations of features with year of diagnosis, gestational age, and birth weight were evaluated using Spearman rank correlation coefficients and Cochran-Armitage trend tests. Incidence rates per 100 person-years were calculated using incident cases of IH as the numerator and age- and sex-specific estimates of the population of Olmsted County, Minnesota, as the denominator. The denominators were obtained from a complete enumeration of the Olmsted County, Minnesota,