Ophthalmology
Available online 26 January 2021
In Press, Corrected Proof

Reports

Incidence of Retinoblastoma Has Increased: Results from 40 European Countries

Andrew W. Stacey MD [1], Richard Bowman FRCOphth [2, 3], Allen Foster FRCOphth [2], Tero T. Kivelä MD [4], Francis L. Munier MD [5], Nathalie Cassoux MD, PhD [6], Ido Didi Fabian MD [2, 7]
Global Retinoblastoma Study Group

https://doi.org/10.1016/j.ophtha.2021.01.024

Keywords

Familial; Fitness; Genetic; Incidence; Retinoblastoma

First page preview

Open this preview in PDF

ARTICLE IN PRESS

AMERICAN ACADEMY OF OPHTHALMOLOGY®

Reports

Incidence of Retinoblastoma Has Increased: Results from 40 European Countries

Retinoblastoma is the most common intraocular malignancy. Its incidence has been reported to be 1 case in from 15 000 to 18 000 live births, or approximately 12, 6, or 4 cases per 1 million children younger than 5, 10, or 15 years, respectively.[1,2] The aim of this study was to estimate the incidence of retinoblastoma across European countries within a 1-year time frame. Data were collected through an international, multicenter, 1-year cross-sectional analysis that has been described in detail previously.[3] Briefly, retinoblastoma treatment centers reported all new cases of retinoblastoma that were diagnosed between January 2017 and December 2017. The final analysis involved only those countries that described their data as being likely complete. The human ethics committees of the London School of Hygiene and Tropical Medicine as well as the ethics committees of all local hospitals approved the study. All research adhered to the tenets of the Declaration of Helsinki. The requirement for informed consent was waived because of the retrospective nature of the study.

Two methods were used to estimate the incidence rate of retinoblastoma: the live birth method and the age cohort method.

$$\text{Incidence (live birth)} = \frac{\text{No. of Retinoblastoma Cases in 2017}}{\text{Population in 2017} \times \text{Crude Birth Rate in 2017}}$$

Country population estimates and birth rates were retrieved from the World Bank Population Prospects and the United Nations database for 2017. The formula used to calculate the live-birth incidence rate in each country is:

The formula used to calculate the age cohort incidence rate (per 1 million children younger than 5 years) is:

$$\text{Incidence (age cohort)} = \frac{\text{No. of Retinoblastoma Cases in 2017}}{\text{Population Estimate Age} < 5 \textit{ Years in } 2017} \times 1 \text{ Million}$$

Bootstrap sampling was used to estimate the distribution of each incidence rate. Linear regression analysis was conducted to identify factors that may affect the country-level incidence rate, including the following variables: age at diagnosis, proportion of bilateral cases, proportion of familial cases, proportion of male births, and per capita gross domestic product for the year 2017 (World Bank database). Summary data were calculated for each country and European region (north, south, east, west). An α level of 0.05 was used.

From the original 40 countries (with 517 retinoblastoma patients), 24 countries were identified as representing likely-complete national-level data, and all 294 patients from these 24 countries were included in the analysis (Table 1). The number of live births for the year 2017 was calculated for each country and region (Table 1). The combined data resulted in a live birth incidence rate of 1 in 13 915 (confidence interval [CI], 12 315–15 150), or 7.2 per 100 000, live births in Europe. The analysis was repeated with the United Nations population data and similar outcomes were seen for each country and overall (1 in 13 844 live births; CI, 12 309–15 083). The highest live birth incidence was seen in northern Europe (1 in 12 907 live births), whereas the lowest incidence rate was seen in southern Europe (1 in 17 177 live births; Fig S1, available at www.aaojournal.org).

The combined age cohort incidence rate was 14.1 per 1 million children younger than 5 years (CI, 12.9–15.9 per 1 million children younger than 5 years) and 4.6 per 1 million children younger than 15 years (CI, 4.1–5.2 children younger than 15 years; Table 1). The age cohort results were used in a linear regression analysis (Table S2, available at www.aaojournal.org). No significant relationship was found between incidence rate and country gross domestic product. The only variable that resulted in a significant association with incidence rate was the proportion of familial cases ($P = 0.002$), which showed an increasing relationship between the proportion of familial cases and the incidence rate within that country. A similar trend was present for the countries grouped by region (Fig S2, available at www.aaojournal.org).

The incidence rates calculated in this study—1 in 13 844 live births or 14.1 and 4.6 per 1 million children younger than 5 and 15 years, respectively—are higher than those reported previously. Although some studies have suggested stable incidence rates over many years through the early 2000s,[1,2,4] recent national data from Finland document an increase from approximately 1 in 16 700 live births to 1 in 12 500 live births from 1990 to 2014.[5] The increase in Finland was not evident when familial retinoblastoma was excluded. Our study supports the conclusion that the incidence of retinoblastoma has increased in recent decades even more widely in Europe because of an increasing number of familial patients.

Improvements in treatments in higher-income countries are leading to less visual impairment,[6] better eye preservation, and better survival. This has led to a reduction in the coefficient of selection, increased fitness, and an increased percentage of familial retinoblastoma in high-income countries.[3] As the percentage of familial cases increases, the overall incidence of retinoblastoma should increase. The results of this study document this increase throughout Europe.

One important finding from these data comes from 2 large countries included in the study whose completeness could not be verified: Italy and Germany. These countries reported high

Recommended articles Citing articles (0)

Disclosure(s): All authors have completed and submitted the ICMJE disclosures form.

The author(s) have no proprietary or commercial interest in any materials discussed in this article.

FEEDBACK

HUMAN SUBJECTS: No human subjects were included in this study. The human ethics committees of the London School of Hygiene and Tropical Medicine as well as the ethics committees of all local hospitals approved the study. All research adhered to the tenets of the Declaration of Helsinki. The requirement for informed consent was waived because of the retrospective nature of the study.

No animal subjects were included in this study.

Author Contributions:

Conception and design: Stacey, Bowman, Foster, Kivelä, Munier, Cassoux, Fabian

Analysis and interpretation: Stacey, Bowman, Foster, Kivelä, Munier, Cassoux, Fabian

Data collection: Stacey, Bowman, Foster, Kivelä, Munier, Cassoux, Fabian

Obtained funding: N/A; Study was performed as part of the regular employment duties of all authors at their institutions. No additional funding was provided.

Overall responsibility: Stacey, Bowman, Foster, Kivelä, Munier, Cassoux, Fabian

View full text