**Heritability of Various Cancers Among Twins**

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Cancer incidence, heritability, mortality

**Abstract**

Cancer research over the years has led to vital discoveries in causative agents and genetics. Familial risk is a common area of study that provides significant guidance to uncovering the extensive role genetics plays in development of various cancers. A specific study aiming to determine incidence rates and heritability of a wide range of cancers known as the Nordic Twin Study was performed on a large group of both monozygotic and dizygotic pairs of twins in regions of Finland, Sweden, Norway and Denmark. The Nordic Twin Study was the largest twin study to date and gathered crucial information over 30 years linking familial risk and heritability to the development of cancer. Collection and analysis of incidence rates in the study show monozygotic twin pairs have a slightly higher risk for cancer development upon diagnosis of cancer in the co-twin. Results of the study are included in the paper, showing percentages of incidence rates among the participating twins as well as rates of incidence for specific types of cancers.

**Introduction**

The heredity of cancer remains a prime topic in cancer research. The Nordic Twin Studies aim to discover genetic components of cancer present in families, more specifically in twins. Continued research into biological factors of cancer allowed the researchers of various studies to evaluate trends of cancer development in a specific country, in twins, and to compare these results to the general populations. Of the multiple studies, they have found that familial cancer risks in twins are in excess and run similarly to the rates of the overall population. They also were able to find evidence of hematological malignancy risks within families. More research is being done over the manifestation across cancer sites, instead of within, as they have found twin cancer is widespread over these sites. The goal of this microreview paper is to analyze, in depth, the areas of study of specific cancer that was focused on and continues to be focused on by researchers in the Nordic Twin studies.

**Recent Progress**

The Nordic Twin study focused on cancer and the heritability of the disease in twins of Denmark, Norway, Finland and Sweden. The study conducted was based on some previous knowledge that familial risk has been linked to the development of various types of cancer, however, the extent remains unknown. In order to estimate the heritability and familial risk of cancers, a large group of 80,309 monozygotic twins and 123, 382 of same sex dizygotic twins within these Nordic regions were studied (Mucci, Hjelmborg, et. al., 2015). Follow up on the twins involved in the study occurred between 1943 and 2010. Within the time frame of the study, there were 50,990 participants that died, while 3,804 moved out of reach for follow up. The results of the study roughly 27,000 cases of incidence cancer in nearly 24,000 individuals which calculated to a 32% incidence rate. There were cancer diagnoses in both twins in 1388 monozygotic and 1933 dizygotic pairs, with 38% of monozygotic pairs and 26% of dizygotic pairs diagnosed with the same kinds of cancer (Mucci, Hjelmborg, et. al., 2015). Twins of the study were shown to have an excess absolute risk calculated for developing cancer if their co-twin had received a cancer diagnosis, 5% higher in dizygotic and 14% higher in monozygotic twins in comparison to the overall 32% risk of the entire study. Indications of increased risk proved to be higher in monozygotic twins in comparison to dizygotic twins. An overall heritability rate of cancer reported a 33%. Results went further as to show the heritability rates of several cancer types including melanomas and nonmelanomas of the skin, prostate cancer, ovarian cancer, as well as kidney, uterine and breast cancers (Mucci, Hjelmborg, et. al., 2015).

**Discussion**

Based on the findings of the Nordic Twin Study, it is evident that familial risks do in fact apply to cancer development in both monozygotic and dizygotic twins. The main takeaway of the study was results of incidence cancer, more specifically, the familial risk one twin has based on the development of cancer in co-twin. In addition to exploring the incidence rates of cancer among the twins in the study, heritability or the variance proportion of cancer risk present as a result of differing individual genetics. This type of information and data collected is vital to further research and education in regard to cancerous developments in twins, both

monozygotic and dizygotic pairs. Continuation of research focusing on cancer among twins is likely to occur as it is still widely unknown. There are still questions of whether or not there are identifiable genes inherited that may cause cancer among not only twins but individuals as a general population, or even environmental areas that aid in cancer development. Cancer research has progressed over the years, however, there are endless amounts of information yet to be discovered.

**References**

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