**Cancer in Adolescents and Young Adults**

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**Cancer is one of the leading causes of death worldwide. This is the case for adolescents and young adults since cancer is one of the top five leading causes of death in this age group. With the rise of cancer cases in this age group, it is important to study the cancers that have the most effect on adolescents and young adults. This study focused on mortality rate, incidence rate, and five-year relative survival of cancers found in AYA patients and the trend analysis of those three things from 1975 to 2016 on the cancers with the highest mortality rates. The results showed that there were nine cancers with significant mortality rates. The results also suggested that there were significant improvements in five-year survival rate, mortality rate, and incidence rate in certain cancers but there were cancers where there was not an improvement over time in some cancers. It is important for further understanding and improvement of treatment in adolescents and young adults regarding the effects of cancer, survival rate, mortality rate, and incidence rate.**

**Introduction**

Cancer is the one of the leading cause of deaths worldwide. There are more than 100 types of cancers that affect people worldwide. Cancer effects nearly every part of the body and all types are potentially life threatening. When we think about cancer, we usually associate it with being relevant in older ages, but that is not always the case. Cancer incidence rates for teens and young adults are rising. About 80,000 young adults and adolescents aged 15 to 39 are diagnosed with cancer each year in the United States. The spectrum of cancer in AYA’s is distinct from that in younger and older populations (Barr et al. 2016). The most common cancers found in this age group includes breast cancer, lymphomas, melanoma, sarcomas, cervical cancer, ovary caner, thyroid cancer and colorectal cancer (Lewis et al. 2021). Although adolescents and young adults have a five-year survival rate of approximately 80% cancer is still one of the top five leading causes of death in this age group. The study I looked at over the topic of cancer in adolescents and young adults was found in the American Cancer Society Journals and wanted to use recent data to analyze long term survival trends for cancer types with the highest mortality rates among adolescents and young adults (AYA’s) and interpret the data in the context of incidence, survival and mortality trends from 1975 through 2016.

**Methods**

The researchers wanted to focus on four major things: the five-year relative survival (RS) in years 2009 to 2015, mortality rates from 2012 to 2016, incidence rates from 2012 to 2016 and trend analysis of RS, mortality rate, and incidence rate from the years of 1975 to 2016. They calculated 5-year relative survival (RS) for AYAs diagnosed with cancer between the ages of 15 and 39 years in 2009 to 2015 using Surveillance, Epidemiology and End Results 18 (SEER-18) software. Using the data from the National Center for Health Statistics they calculated US cancer mortality rates per 100,000 for AYA’s for deaths occurring between the ages of 15 to 39 years in 2012 to 2016. The researchers calculated the incidence rates per 100,000 for AYAs diagnosed between 2012 and 2016 using the SEER-21 registries which represents 36.7% of the US population. When looking at the change over time from 1975 to 2016 they used the historical SEER-9 area to calculate RS by diagnosis year, mortality rate and incidence rate change over time but the trend analysis for these three things over the years was restricted to the nine cancer types that had the highest mortality rate.

**Results**

This study found that there were nine types of cancers that had the highest mortality rates per 100,000 patients. These nine were: female breast cancer (2.19); brain and other nervous systems cancers (0.97); cervical cancer (0.91); colon and rectum cancer (0.88); bone, joint, and soft tissue sarcomas (0.75); ovarian cancer (0.44); lung and bronchus cancer (0.43); acute myeloid leukemia (0.40); and non-Hodgkin lymphoma (0.40). These nine sites represent nearly 62% of all cancer deaths among AYA’s and nearly 42% of all new AYA cancers diagnosed.

The researchers also looked at the trend analysis of these nine to see how the mortality rate of these cancers changed over a period. There were some surprising results. The data supported that some cancers were found to have a steady decline throughout all the years of this study. These cancers include ovarian and lung cancer. There was one cancer that had an increase in mortality throughout all the year of the study and that was colon and rectum cancer mortality. Even though it was an increase it was a very small and not a significant increase. It showed about a 1% increase throughout the whole study. Some other cancers in this research had either a decrease or increase in certain years but then changed in other years. Female breast cancer mortality had declined from the years of 1986 to 2012 and then started to increase again in 2012. For brain and other nervous system cancers, the mortality decreased from 1994 to 2007 and then had a stable trend line in 2007 till the research ended. Acute myeloid leukemia’s mortality rate declined in the 1970’s and 1980’s and then stabilized between 1988 and 2008 and since 2008 has started declining. Non-Hodgkin lymphoma mortality rate had a dramatic decrease between the years 1995-2002 and then again in 2002 to 2016. The trend analysis did show that some cancers mortality rates did not fluctuate throughout the study. Cervical cancer mortality had a consistent flat rate from the start of the study until the end. Bone, joint, and soft tissue sarcomas had a flat mortality rate throughout the years.

However, the nine highest mortality rates were not the same as the nine that had the highest incidence rate. The nine highest incidence rates per 100,000 were: female breast cancer (22.41); Thyroid cancer (12.79); Testicular cancer (11.19); Melanoma of the skin (6.42); cervical cancer (5.89); Colon and rectum cancer (4.54); non-Hodgkin lymphoma (4.17); uterine cancer (3.69); and Hodgkin lymphoma (3.61). The trend analysis was also looked at for incidence rate from 1975 to 2016 but again only for the nine cancers with the highest mortality rates. The incidence trends for female breast cancer were more varied and from 1994 to 2016 increased. Brain and other nervous system cancers incidence rate has been stable since 1987. Cervical cancer showed a decreasing trend in the incidence rate from 1975 to 2015. The incidence rate for colon and rectum cancer has increased a significant amount since 1988. Bone, joint, and soft tissue sarcomas also showed an increased incidence rate from 1975 to 2016. The incidence rate for ovarian cancer has been stable since 1996 there was a decrease between 1993 and 1996. Lung cancer incidence rate showed a decline over the years. Acute myeloid leukemia incidence rate has increased since 1987. Lastly non-Hodgkin lymphoma incidence rate increased between 1983 and 1991 and that is believed to be because of the HIV epidemic and then stabilized in 1991.

The researchers also found the results for the five-year relative survival for cancer. The highest five-year relative survival was found in thyroid cancer being 99.73 in this age demographic of 15-39 years. The lowest five-year survival rate from 2009 to 2015 was esophageal cancer being 21.55.

The five-year RS that they looked at over time only included the cancers with the highest mortality rate. Female breast cancer RS increased from 1985 through 2007 at an annual rate of 0.66 and was stable after 2007. Brain and nervous system RS increased steadily from 1975 to 2011 with an annual rate of 0.70. Cervical cancers 5-year RS was more than 80% in 1975 and remained steady all the way through 2011. The five-year RS for colon and rectum cancer had a significant and continuous increase of 0.59. Bone, joint and soft tissue sarcomas had a five-year RS that increased by 0.82 from 1975 to 1989. Ovarian cancer had a slight rise of 0.24 for the whole period of 1975 to 2015. Lung cancer had a five-year RS that significantly increased 1.43 between 1998 and 2011. The five-year RS that showed the largest improvement over the whole span of time was acute myeloid leukemia. The RS started out in 1975 at about 10% and by 2011 was at more than 60%. Another RS that had a large improvement was non-Hodgkin’s lymphoma with a 2.97 between the years of 1992 and 2003 and a smaller improvement of 0.71 in 2003 to 2011.

**Discussion**

This study shows that the trend analysis from 1975 to 2016 for most cancers that are most prominent in AYA’s showed a decrease in mortality rate and incidence rate over time. This is due to the fact new prevention options are becoming more readily available, advances in diagnosis due to more screening and better screening devices, and treatments. However, this study shows that there is still a need to focus on cancers affecting adolescents and young adults since we only ever associate cancer with age so there is still so much, we need to focus on with this age demographic and cancers associated with it. Other studies could focus on the treatment that is received or available for this age demographic. The study highlighted concerns regarding high number of female breast cancer and the decrease in survival rates, colorectal cancer incidence rate increase and the slow progress for sarcomas and AML. The researchers suggest that an investigation of biological differences among this age group that could be affecting survival rates of these patients with these types of cancer (Lewis et al. 2021). Even though the numbers of adolescents and young adults that have cancer are not as high as the rate of cancer in other age demographics it is still important, we focus research on adolescents and young adults since this number is increasing.

**References**

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