Stomach cancer incidence rates among Americans, Asian Americans and Native Asians from 1988 to 2011

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Abstract:

Purpose: The current global trend of stomach cancer incidence has shown a substantial decline for the past decades. However, stomach cancer is still the second most common cancer in Eastern Asia which accounts for approximately 50% of all new cases of stomach cancer worldwide. Our objective was to compare the stomach cancer incidence rates of Asian-Americans living in Los Angeles with the native East Asians to assess imperative clues or etiology of stomach cancer from 1988 to 2011 and to verify whether the environmental or lifestyle factors contribute to the incidence of stomach cancer.

Methods: To examine the differences of stomach cancer incidence rates of the same ethnicities with geographical differences, Asian Americans (Korean-, Japanese-, Chinese-, and Filipino-Americans in Los Angeles, California, US) and native Asians (Korean, Japanese, Chinese and Filipino) were selected in this study. Using the database of Cancer Incidence in Five Continents (CI5), stomach cancer incidence rates were examined. Data from National Cancer Registry of Korea were used to collect incidence rates for native Koreans. All data were standardized to world population according to Segi 1960.

Results: Between native countries, the incidence rates in Japan, China, Philippine, US declined whereas the incidence rates in Korea remained constant. The incidence rates of Asian immigrants were lower than native Asians. In both sexes, the age-standardized cancer incidence rate for native Korean (male, 65.4 per 100,000; female, 24.7 per 100,000) showed the highest rate whereas non-Hispanic whites showed the lowest rate (male, 5.9 per 100,000; female, 2.7 per 100,000). The incidence rates of males were about 2 times higher than females in Asian countries while the rates of non-Hispanic whites were similar.

Conclusion: The effect of migration on stomach cancer incidence suggests that lifestyle factors are a significant determinant on the risk of stomach cancer. However, it is important to note that Korea remains to be a country with the highest stomach cancer incidence rates with no changes in the rates. This implies that imminent interventions must take place to reduce the stomach cancer incidence rates in Korea.

Key words: Asian-Americans, stomach cancer, incidence, immigrants

Key messages: 전 세계적으로 위암 발생률이 낮아지고 있다. 본 연구에서는 미국으로 이주한 아시안 이주민들의 위암 발생률이 현지의 아시안들보다 더 낮다는 것을 보여준다. 이주한 동일 인종의 위암 발생률이
Introduction:

Stomach cancer is the fifth most common cancer in the world and approximately one million new cases have occurred in 2012 (GLOBOCAN, 2012). The current global trend of the stomach cancer incidence has shown a substantial decline since 1974 when the stomach cancer was the world’s most common cancer. Although the stomach cancer incidence rates have declined in East Asian countries following the global trend, stomach cancer is still the second most common cancer in East Asia which accounts for approximately 50% of all cases of stomach cancer worldwide (McCracken et al., 2007). Among East Asians countries, Korea has the highest incidence of stomach cancer in the world (World Cancer Research Fund Int'l, 2013) and China has a great health burden of stomach cancer as it accounts for more than 40% for all new cases (Bertuccio et al., 2009). Likewise, the high stomach cancer incidence remains as a big public health problem in Japan despite of its early detection screening programs (McCracken et al., 2007). In contrast, the US is one of the countries with the lowest stomach cancer incidence where stomach cancer does not belong to the top 15 common cancer (GLOBOCAN, 2012). Based on the recent report, the stomach cancer incidence rate of Korea was 11.7 times higher than the incidence rates of US (GLOBOCAN, 2012). Thus, studies comparing countries with high and low incidence rates seem necessary as it could provide a valuable insight on the etiology and the possible preventive methods to reduce stomach cancer incidence rates and ease the health burden.

US is a heterogeneous country with many immigrants and the number of Asian-Americans count up to 4.6 million, representing 5.6% of the total US population. The state of
California has the largest Asian populations (Jemal, Center, DeSantis, & Ward, 2010). Many Asian-Americans live in Los Angeles, California in particular where Chinese Americans make up the most of the Asian population (4% of the total population) followed by Filipinos, Koreans and Japanese (American Cancer Society, 2011). Owing to this racial make-up, the state of California puts special efforts in collecting data for cancer incidence rates of each specific ethnic group specifically those living in Los Angeles.

Since the stomach cancer incidence in US is significantly lower than Asia, comparing the cancer incidence rates of Asian-Americans living in Los Angeles with the native Asians in their own respective countries could provide an imperative clue and the etiology regarding the stomach cancer incidence. The Asian countries with high-risk of stomach cancer including Korea, Japan, China and Philippine were selected due to their geographical proximity and cultural similarity. Non-Hispanic whites in Los Angeles were included as a reference group.

Several studies have demonstrated the risk factors of stomach cancer and some of the established risk factors include *H. pylori* infection, smoking and diet (McCracken et al., 2007). Among these three risk factors, diet habits change most dramatically when one move from an Asian country to a Western country, a term known as “dietary acculturation” (Trafton, 2011). Many of the research papers indicate the negative impacts of dietary acculturation such as obesity and diabetes (Crew & Neugut, 2006). However, in this research we hypothesize that this diet acculturation of Asian-Americans have a positive impact on stomach cancer incidence and that those immigrants may benefit from assimilating their diet into westernized foods and staying away from their traditional salted and pickled foods. Thus, the objective of the present study is to compare the stomach cancer incidences of Asian immigrants living in Los Angeles, California with native Asians by gender and age group.
Methods:

Cancer Incidence in Five Continents (CI5) is an international cancer incidence report generated by the International Agency for Research on Cancer and the International Association of Cancer Registries (Haiman et al., 2006). The International Classification of Disease (ICD, 10th revision) code for stomach cancer i.e. C16 was used. CI5plus database provided race-specific, age-specific, gender-specific and cancer site-specific estimates for 118 selected populations. The data source for Asian ethnic groups in the US were only found from the state of California, Los Angeles and only Korean, Japanese, Chinese and Filipino ethnicities were provided thus selected for this study. The composition of Asian populations in Los Angeles included 4.2% of Chinese, 3.3% of Filipino, 2.2% of Korean and 1.0% of Japanese (United States Census, 2014). The age-standardized rates per 100,000 world population which was proposed by Segi in 1960 were used. In addition, the rate per 100,000 was used to compare the annual incidence rates of stomach cancer by age-groups of 5 year intervals from 10 to 85+.

The stomach cancer incidence rates for native Asian countries were also collected from CI5 for reliability of data comparison. Since the CI5 didn’t have data for entire countries, the data from specific regions of each country were compared for native Asian groups. The well-known cities of each country was selected namely, Osaka for Japan, Shanghai for China, and Manila for Philippines. However, Statistics Korea was used for the data of native Koreans because CI5 didn’t provide data for Korea. Since the data were calculated based on Korean population, direct standardization method was used to convert the data into Segi world population for consistency.

Results:
Comparison of annual stomach cancer incidence rates by gender and race (non-Hispanic whites, Korean-, Japanese-, Chinese-, and Filipino-Americans in Los Angeles, CA, vs. native
Korean, Japanese, Chinese and Filipino).

For males, the age-standardized overall cancer incidence rate for native Korean (average 65.4 rates per 100,000) was the highest among all the races whereas Filipino-Americans showed the lowest rate (average 5.9 rates per 100,000) as shown in Figure 1. Among the native groups, Japanese, Chinese, Filipinos and non-Hispanic white males showed a decrease in incidence rates whereas Korean males showed a constant incidence rates. For all ethnicities, the overall stomach cancer incidence rates of immigrants were lower than native groups. The incidence rate of Korean-American males decreased by a third of the incidence rates of native Korean males. The incidence rate of Japanese-American males and Filipino-American males decreased by two thirds of the incidence rates of native Japanese males and native Filipinos males. The incidence rate of Chinese-American males decreased by three quarters of the incidence rates of native Chinese males. Among Asian male immigrants, the incidence rate of Korean-American, Chinese-American, and Filipino-American remained constant while the incidence rate of Japanese American decreased.

For females, the age-standardized overall cancer incidence rate for native Korean (average 24.7 rates per 100,000) was the highest among all the races whereas Filipino-Americans showed the lowest rate (average 2.7 rates per 100,000) as shown in Figure 2. Among the native groups, Japanese, Chinese, Filipinos and non-Hispanic white females showed a decrease in incidence rates whereas Korean females showed a constant incidence rates. For all ethnicities, the overall stomach cancer incidence rates of female immigrants were lower than native groups. The incidence rate of Korean-American females decreased by two thirds of the incidence rates of native Korean females. The incidence rate of Japanese-American and Chinese-American females decreased by half of the incidence rates of native Japanese and native Chinese females. The incidence rate of Filipino-American females decreased by a third of the incidence rates of native Filipino females. Among Asian female
immigrants, the incidence rate of Korean-American, Japanese-American, and Filipino-American remained constant while the incidence rate of Chinese American decreased.

Between males and females, there was a great disparity in the overall incidence rates of stomach cancer. The incidence rates of males were significantly higher than females for all groups. The highest disparity was shown between the incidence rate of native Korean males and females; native Korean males showed 2.6 times higher rates than female counterparts.


For both male and female, the stomach cancer incidence rates increased with age in all age group as shown in Figure 3 and 4. The increases in incidence rates of stomach cancer with age were steep for native Korean, native Japanese, native Chinese as well as Korean-American and Japanese-American. Among the different racial groups in Los Angeles, California, the increase of stomach cancer incidence rate of Korean American was the steepest which could be expected based on the rates of native Korean. The native Filipinos showed the lowest incidence rate. From age 70+, the incidence rates decreased for all groups except Japan where the incidence rates continued to increase.

A big disparity was shown between males and females in the incidence rates for all groups. The incidence rates of males were significantly higher compared to the rates of females.

Discussion

A steady decline in stomach cancer incidence has been observed worldwide over the last decades including historically high risk countries such as Japan and China (Kamineni, Williams, Schwartz, Cook, & Weiss, 1999). The stomach cancer incidence rates have decreased by more than 80% in the US (Ezzati, Henley, Lopez, & Thun, 2005). Likewise, the
same decreasing trends have been observed in the present study except native Korea which may be due to increased accessibility of screening and early detection. The incidence of Asians decreased when they moved to the US where incidence rate of stomach cancer is low. This demonstrates that environmental factors play a great role in stomach cancer incidence rates. The known factors that account for this decline include antibiotics against *H. pylori*, early detection programs, improved medical treatments and changes in dietary habits by consuming fresh vegetables and fruits rather than traditional pickled and salted foods (CDC, 2014). Nevertheless, the fact that there was no change in the incidence rates of stomach cancer in Korea is questionable.

In addition, the incidence rates of males were found to be significantly higher than females for all groups except non-Hispanic whites. Generally, the stomach cancer incidence rates were about twice as high in males than in females (WHO: Western Pacific Region, 2014). The detailed analysis and explanation of gender differences are not available, instead only vague theories assume that the behaviors of males such as tobacco smoking are related to higher risk factors. One interesting study conducted by MIT researchers showed that estrogen could potentially protect females from developing stomach cancer (Japan Tobacco Inc., 2014). Furthermore, the present study showed that the incidence rates were increasing with age and peaked at age 70s. According to Crew and Neugut, the incidence rates rise progressively with age, where highest incidence rates were observed between 50 and 70 years (Parkin, 2006). However, the trend decreased for the most of groups from age 80+ which may be due to selective survival bias and poor quality of incidence data at older ages.

The overall cancer incidence rate for native Korean was the highest among all groups for both males and females whereas both non-Hispanic whites and Filipino-Americans showed the lowest incidence rate. Interestingly, the pattern of incidence rates within Asian-
American ethnic groups resembled the incidence rates of their native countries. The order of highest to lowest incidence rates was Koreans, Japanese, Chinese, Filipinos among native Asians and the same order was observed among Asian immigrants, highest incidence rates in Koreans, followed by Japanese, Chinese and lastly by Filipinos. Several studies have demonstrated that cancer incidence rates of immigrants followed the direction of incidence rates of the country that they moved to (Fock et al., 2008). One study that examined the stomach cancer incidence rates of Asian immigrants in the US from 1973 to 1986 indicated that the stomach cancer incidence of Chinese immigrants were similar to that of whites. This demonstrates that the lifestyle has a significant impact on the stomach cancer incidence (Kamineni et al., 1999). Another study supported the importance of environmental factors by demonstrating the migrant effect on stomach cancer incidence among Japanese in Hawaii (Kolonel et al., 1981).

In general, smoking, dietary patterns and *H. pylori* infection have been known to be the major risk factors for stomach cancer. The differences in smoking prevalence seem to reflect geographical variations of incidence rates between the US and Asia (American Cancer Society, 2011). The smoking prevalence was lower in the US compared to Asian countries; the overall smoking prevalence for US was 18.1% while China was 28.1%, Philippine 28%, Korea 25.8% and Japan 19.7% (CDC, 2014; Japan Tobacco Inc., 2014; WHO: Western Pacific Region, 2014). This is reflected in the incidence rate of stomach cancer as the US had the lowest stomach cancer incidence among 5 countries under study. Therefore, the variability in tobacco use between the countries suggests the association between smoking prevalence and stomach cancer incidence.

Furthermore, the disparity of stomach cancer incidence between males and females can be explained by smoking prevalence. The smoking prevalence in US was 20.1% for
males and 14.5% for females (CDC., 2014). For Asian countries, the differences in smoking prevalence between males and females were extreme. In Korea, the smoking prevalence rate was 43.7% for male and 7.9% for female (Adult Smoking Rate, 2013). Similarly, the proportions of smoking prevalence were 32.2% for males and 10.5% for females in Japan (Japan Tobacco Inc, 2014). In China, the majority of tobacco use was from male at 52.9% compared to female at 2.4% (WHO, 2014). In Philippine, 47% of males and 9% of females were tobacco smokers (Department of Health, 2010). These findings were reflected in the differences observed in the stomach cancer incidence as males had more than two times higher incidence than females. This also suggests that males are more likely to seek risky behaviors than females. Therefore, this study demonstrates that there is an association between smoking and stomach cancer incidence by country and gender.

As for dietary patterns, traditional Asian meals contain salt preserved foods including soups which make the amount of salt intake of whites relatively low. In addition, the geographical variations of stomach incidence rates reflect the differences in prevalence of H. pylori infection, which accounts for more than 60% gastric cancer worldwide (American Cancer Society, 2011). The prevalence of H. pylori infection reaches up to 50% among general populations in countries like Korea, Japan and China (Salih, 2009). Interestingly, the stomach cancer incidence of Philippine was lowest among Asian countries despite of salty dietary habit and high prevalence of H. pylori. Further investigations is needed to examine etiology of stomach cancer in Philippine.

There were some limitations in this study. First, the incidence rates for Korean-, Japanese-, Chinese-, and Filipino-Americans were less accurate due to missing values and zero rates for certain years. This might have been due to limited numbers of Asian-Americans in Los Angeles as these ethnic groups are too specific in a confined geographic area. Another
factor could be the different immigration patterns over the time period. Second, the high incidence rates in Korea and Japan may reflect good practice of screening programs and accessibility to early detection services. This could have led to underestimation of the actual incidence rates in China, Philippine and US. Finally, the data obtained from CI5 might have had some misclassification regarding race. For example, Vietnamese could have classified themselves under Chinese and persons of mixed race into only one race. The length of residence in California is another factor that could have distorted the result of the study. Furthermore, it is hard to generalize this findings because it is only limited to those residents living in Los Angeles where high number of Asian populations live in. Lastly, the data for native Korean incidence rates were only available from 1999.

This study compared the incidence rates of stomach cancer between Asian immigrants and native Asians. The migratory effect on stomach cancer incidence suggests that lifestyle plays an important role in the development of stomach cancer. It is expected that increased overall socioeconomic status as well as hygienic condition could have accelerated the decrease in trend of stomach cancer incidence among immigrants. Increased availability of fresh vegetables and fruits could have modified the immigrants’ dietary habits. Lastly, it is important to note that Korea remains to be a country with the highest stomach cancer incidence rates with no changes since 1999 while neighboring Asian countries show the decreasing trend. This implies that imminent interventions must take place to reduce the stomach cancer incidence rates in Korea as all other countries have experienced improvements in controlling the stomach cancer incidence.
Reference:


Figure 1. The male age-standardized stomach cancer incidence rates (per 100,000) of non-Hispanic whites, Asian-Americans in Los Angeles, US, and Asian countries by year, 1988-2007.

Data Source: CI5 and National Cancer Registry of Korea.
Figure 2. The female age-standardized stomach cancer incidence rates (per 100,000) of non-Hispanic whites, Asian-Americans in Los Angeles, US, and Asian countries by year, 1988-2007.

Data Source: CI5 and National Cancer Registry of Korea.
Figure 3. The age-specific stomach cancer incidence rates for males by age group of non-Hispanic whites, Asian-Americans in Los Angeles, US, and Asian countries in 2007 (World, per 100,000).

Data Source: C15 and National Cancer Registry of Korea.
Figure 4. The age-specific stomach cancer incidence rates for females by age group of non-Hispanic whites, Asian-Americans in Los Angeles, US, and Asian countries in 2007 (World, per 100,000).

Data Source: CI5 and National Cancer Registry of Korea.