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A Case Study on Gastric Cancer in South Korea versus France: Social Determinants and Risk Factors

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ABSTRACT

Noncommunicable diseases (NCDs) unveil the stark disparities to health equity between developed countries across the globe. Although prevention, treatment, and research of certain NCDs are well-established and funded, others, specifically gastric cancer (GC), do not share the same notoriety. In particular, GC killed more than 768,793 people globally with 1.09 million GC diagnoses in 2020 alone (The Global Cancer Observatory, 2020). This data elucidates the merit of GC for the United Nations Sustainable Development Goal (SDG) initiatives. By examining social determinants between two economically similar countries through an evidence-based case methodology, the results may gleen into avoidable mortality and economic burden, successful prevention, and more favorable prognosis in decreasing the prevalence of GC. This review aims to compare South Korea and France which have one of the highest and lowest prevalence of GC, respectively. The concluding model will serve as a recommendation for countries with high prevalence of GC towards achieving SDG 3, which promotes health and wellbeing across the life course, while advocating for the declaration of health as a human right (United Nations, 2020). Pragmatic, tangible recommendations include partnerships with media to reduce alcohol consumption, sodium reduction campaigns and nutrition programs to promote healthy diets, and expansion of medical clinics in rural areas to reach those who lack access to proper healthcare.

Introduction

A noncommunicable disease (NCD) is an umbrella term defined as a condition that cannot be spread from person-to-person and is often chronic in nature; NCDs include cardiovascular disease, cancer, Alzheimer's disease, diabetes, and many others. Oftentimes, NCDs result from a combination of genetic, physiological, behavioral, and environmental factors such as diet, exercise, and smoking. In 2018 alone, NCDs took 41 million lives, made up 71% of total global deaths (WHO, 2018). Of those 41 million, 34.5 million (83.9%) were avertable, and 9 million were due to cancer alone (Coates et al., 2020; WHO, 2018). Over the past decade, the treatment and toll of NCDs have created an enormous economic impact, with an estimated global cumulative loss of $47 trillion between 2011 and 2030 (KFF, 2019). Cancer alone cost the world $1.16 trillion in 2010 (WHO, 2018). Evidently, the high mortality and monetary toll of NCDs, particularly cancer, poses an immense problem on the global scale.

While cancer affects people of all ages and socioeconomic backgrounds, inequalities that exist amongst countries, such as access to a healthy diet, education, or healthcare, exacerbate incidence and mortality of cancer in certain populations. Each year, approximately one-third of cancer deaths are due to five lifestyle risk factors: high body mass index, low consumption of fruits and vegetables, lack of exercise, smoking, and alcohol consumption (WHO, 2018). At least half of the world's population do not have access to indispensable healthcare services (WHO, 2017). These disparities disproportionately affect vulnerable countries and communities, such as those with a lack of access to healthy food options, education, or healthcare services, violating the Universal Declaration of Human Rights

(UDHR) Article 25 which states that everyone has the right to health and wellbeing. The United Nations (UN) Sustainable Development Goals (SDGs) work towards eliminating these disparities by addressing good health (SDG 3), inequalities (SDG 10), and partnerships (SDG 17) (United Nations Statistics Division, 2020). It is vital to address risk factors in vulnerable countries to decrease premature mortality of NCDs and progress towards these SDGs.

Among the several NCDs and cancers that are prevalent around the world, stomach cancer, or gastric cancer (GC), does not share the same notoriety, despite remaining one of the most common and deadliest cancers worldwide. It is the 3rd deadliest and 5th most commonly diagnosed cancer in the world (The Global Cancer Observatory, 2020). In 2017 alone, GC led to 1.22 million incidences, 865,000 deaths, and 19.1 million disability-adjusted life years (DALYs) (Etemadi et al., 2019). Studies have shown that the Helicobacter pylori (H. pylori) bacteria predisposes individuals towards gastric carcinoma and contributes to a large proportion of the worldwide burden of gastric cancer (Ishaq et al., 2015).

With the interaction of H. pylori as well as many other physiological and environmental risk factors, gastric cancer remains a global NCD that disproportionately affects certain regions in the world. In the Global Burden of Disease, Injuries, and Risk Factors Study (GBD) from 1990 to 2017, the highest incidence and mortality rates of GC occurred in high-income Asia Pacific and East Asia, including Japan, South Korea, and China. In East Asia, 61.3% and 20.7% of age-standardized DALYs were caused by high-sodium diets and smoking, respectively. By contrast, the lowest incidence rates of GC were observed in sub-Saharan Africa and southeast Asia, while the lowest death rates were seen in high-income North America, Australasia, sub-Saharan Africa, and western Europe (Etemadi et al., 2019). The incidence and mortality rates of GC differ throughout certain regions of the world and are dependent on factors including environment, social and cultural norms, and genetics. Therefore, our evidence-based case study focuses on South Korea and France, two economically similar countries with the former having one of the highest GC incidence and mortality rates in the world and the latter having one of the lowest in western Europe.

Though South Korea and France may have similar economies, the burden of gastric cancer impacts each country differently. The gross domestic product (GDP), a measure of a country's economy, is $1.65 trillion in South Korea and $2.72 trillion in France which are comparatively alike (World Bank, 2019). By using two high-income countries, this controls for any economic differences in the analysis of gastric cancer prevalence and mortality. However, from a gastric cancer perspective, these two countries are on opposite sides of the spectrum. In terms of new cases, South Korea has 37,266 new GC cases and France has 7,276 new cases, nearly one-fifth of South Korea. In terms of deaths, South Korea has 7,684 deaths from GC, while France has 5,326 deaths. In terms of male and female cases per 100,000 people, South Korea has 57.8 cases and 23.5 cases, respectively; France has 7.2 and 2.9 cases, respectively (Rawla & Barsouk, 2019).

South Korea's population faces health disparities in both incidence and mortality of gastric cancer. Out of all causes of mortalities in South Korea, cancer accounts for the most deaths, and gastric cancer is the most common cause of cancer deaths. In 2015, GC was the most common cancer in men and 4th most common in women in South Korea. The number of new gastric cancer cases increased from 20,870 in 1999 to 29,207 in 2015. Although the age-standardized rate (ASR) has decreased from 43.6% in 1999 to 33.8% in 2015, South Korea still has the highest ASR for gastric cancer in the world (Kweon, 2018).

In contrast to South Korea, France lies at the opposite end of the spectrum with respect to gastric cancer incidence and mortality. An analysis of 4,620 GC cases from 17 European countries showed that the 1-year, 5-year, and 10-year survival rate of GC patients in France was 44.5%, 20.2%, and 16.2%, respectively. This was much higher than the other 16 European countries (Bouvier et al., 2010). In addition, studies have shown an association between surgical resection and survival rate. Approximately 61.4% of GC patients in France underwent surgical resection; this may correlate to their high survival rates (Bouvier et al., 2010). Early gastric cancer cases and endoscopic surgery are also rare in France, and usually have favorable prognosis (Chapelle et al., 2016). In the prevention of GC, it is vital that dietary change, improved healthcare treatments, decreases in alcohol consumption, and genetic testing are

examined in order to provide early diagnosis and better survival for GC. Growing the coverage of care and preventative strategies would play an important role in reducing the global burden of NCDs (Coates et al., 2020).

Methods

Our paper consisted of an extensive literature review based on the most recent, significant findings. Four key factors that helped us decide whether or not to use the article were publication date, journal, relevant keywords, abstract, and figures. We utilized the three-pass approach to also determine which articles were suitable. The articles we considered were mostly published within the past five years, with exceptions for landmark articles with numerous citations. We only used peer-reviewed articles published in reputable journals to ensure the information was reliable and accurate. In addition, we used statistics from official international databases, including the United Nations and the World Health Organization.

When searching for articles, we used ArticlesPlus, Melvyl, PubMed, and Google Scholar. To narrow down our search results, we used advanced search options, specifying key words and phrases we wanted to appear. Quotation marks were used when searching for exact phrases, such as “gastric cancer” or “social determinants of health.” When searching for data, we looked for official published statistics, especially from reliable sources like the United Nations, World Health Organizations, universities, and government agencies. In order to determine whether an article was relevant, we skimmed each abstract or the conclusion section of peer reviewed articles using the three-pass approach to “skimming” the articles. On the first pass, we read the title, abstract, introduction, headers, and conclusion. As we did this, we looked for keywords and phrases that we could incorporate into our argument. Additionally, we looked for context, validity, and clarity. If the article was unrelated or unimportant, we would move to a different article. During the second pass, we examined the figures to see what the authors were showing and what argument they were making. For any graphs, we would look at maximums and minimums and axes. Finally, during the third pass, we looked into the methods and discussion. This three-pass system allowed us to efficiently decide on whether or not to look more deeply into the paper or look at another one instead. Here, we could determine if the paper as a whole was relevant to our topic and how we could utilize the information presented.

Additionally, because our paper took a human rights perspective on health, we looked for sources that specifically considered this perspective. We determined that the most relevant articles considered an interdisciplinary approach to health, rather than articles that outlined specific biochemical mechanisms behind gastric cancer. Throughout the process, the publication date, databases with peer-reviewed articles, three-pass approach, and article perspectives helped guide us in deciding the most suitable materials to use for our literature review.

Results

There are several uncontrolled risk factors, including genetic, environmental, physical, and mental elements, that increase one’s risk for developing gastric cancer. Many of these risk factors are due to the social determinants of health that play a large role in the inequities present between GC-prevalent countries, such as South Korea, and GC-infrequent countries, such as France. While there are countless risk factors of GC, the three most contributing include unhealthy diet, harmful consumption of alcohol, and limited access to healthcare. This analysis pinpoints certain factors that widen the gap in health disparities which contribute to premature mortality. In order to progress the UN SDGs and achieve health as a human right, looking into risk factors is the first step.

Increased Gastric Cancer Risk Based on Diet

Among the numerous risk factors of gastric cancer, an unhealthy diet is one of the most contributing, yet easily reconciled, risk factors when proper access to healthy options is attained. An unhealthy diet is not only a risk factor for many NCDs, but also for GC, as it is associated with increased gastric cancer carcinogenesis. Dietary risk factors include habitual salt intake (e.g. pickled foods, salted fish, processed meats) (D'Elia et al., 2012), lack of fruit and vegetable consumption in smokers (Gonzalez et al., 2012), high intake of exogenous N-nitrosodimethylamine (NDMA), a cancer-causing chemical (Song et al., 2015), and consumption of red meats and high nitrate vegetables (Kim et al., 2002). Among countries with high and low prevalence of GC, there remains many differences in diet and access to healthy options.

In Korea, dietary habits revolve around high-sodium foods, carbohydrates, and cooked rather than natural vegetables. Consumption of popular Korean foods such as rice, beans, charcoal grilled beef, pollack soup, Kkakduki, Dongchimi, and cooked spinach have been shown to be associated with an increased risk of GC. Radish roots and spinach are used in popular traditional dishes called Kkakduki (diced radish kimchi) and Dongchimi (radish water kimchi), which both contain Korean radish and very salty water. These Korean radish roots can absorb nitrate contents from fertilizers when growing in the soil. The combination of the salt concentration and nitrate from these dishes can increase the risk for GC (Kim et al., 2002). Additionally, Korean barbecue (kbbq) is a popular method for cooking meat over a charcoal grill. However, this cooking method increases the risk of GC as the smoke produced may be associated with carcinogenic compounds (Kim et al., 2002). Foods containing a carcinogen called cadmium, including rice, squid, eel, crab, shellfish, kimchi, and seaweed, also have a positive correlation with gastric cancer risk. Rice is a staple food in Asian countries, including South Korea, which may have an effect on the high incidence of GC (Kim et al., 2019).

Additionally, many studies have conducted research on Korean diets and their link with gastric cancer. In a study on 812 gastric cancer patients in South Korea, 51.8% and 69.4% of males liked salty and spicy tastes, respectively. These flavors can irritate the inner lining of the stomach, which can increase the risk of gastric carcinogenesis. In addition, male GC patients consumed 6,488.5 mg of sodium per day, greater than three times the daily recommendation (Lim et al., 2012). Ren et al. concluded that picked foods are associated with over a 50% risk of GC, which may be higher in Korea, since Koreans consume an average of 200-300 grams of various salt-fermented vegetables per day (2012). With H. pylori being a well-established cause of gastric cancer, studies have shown that Koreans with this infection and high sodium intake increase their risk of developing GC ten times more than Koreans without the infection and with low sodium intake (Lee et al., 2003).

Contrarily, diet patterns in France are very different from South Korea, which may be revealing of their low GC incidence rates. Studies have shown that higher consumption of lycopene foods is inversely related to the risk of GC. France consumes 4,750 micrograms of lycopenes per day, while South Korea consumes 2,575 micrograms per day (Lee et al., 2013; Porrini & Riso, 2005). Also, less than two percent of the residents of Marseille, France consumed smoked, cured, and salted fish and meat; in fact, this region has especially low GC mortalities (Pobel et al., 1994). Finally, in France, consistent mealtimes are an essential part of their culture. Most French adults maintain a balanced three-meal schedule each day, which is important for decreasing GC risk (Si Hassen et al., 2018).

Evidently, the social determinant of access to healthy food options drastically differs between South Korea and France. Korean diet tends to be high in sodium, fermented, pickled, or grilled, while French diet tends to incorporate more fruits, vegetables, and lycopenes. There is a distinct disparity in access to healthy food options between these two countries, which can play a prominent role in health outcomes. Other contributing factors may include a lack of education regarding healthy lifestyles, money to purchase nutritional foods, time to cook these meals, etc. However, accessibility remains a key social determinant of health, which is needed in order to achieve SDG 3 and health as a human right.

The Effect of Alcohol Consumption on GC

In addition to an unhealthy diet, alcohol consumption increased the risk for gastric cancer with higher consumption resulting in higher risk. This could be attributed to the fact that ethanol can cause damage to the gastric mucosa by disrupting the balance between defense and external invasion. Due to its fat-soluble characteristics, alcohol facilitates the process of harmful chemicals entering the upper digestive tract (Ma et al., 2017). The specific type of alcohol could also be a determinant in gastric cancer incidence with studies showing that wine consumption was associated with a lower risk. Wine, as opposed to beer or liquor, inhibits the growth of H. pylori by increasing intragastric acidity (Jonkers et al., 1999). Wine also contains resveratrol, a factor that has anticarcinogenic properties not present in other forms of alcoholic beverages (Barstad et al., 2005).

South Korea and France have widely differing cultures surrounding alcohol consumption. South Koreans promote drinking practices surrounding socialization rather than taste. Consuming alcohol has been established as an integral part of work life. Coworkers share ideas and network after business hours while encouraging each other to drink (Cakar & Kim, 2016). This environment is conducive to overdrinking, as it normalizes alcohol in a professional setting. Often during job interviews, interviewees are asked "How much alcohol can you handle?" They are then presented with shots to drink in front of their potential employer. The interviewers evaluate how well they can drink due to a belief that those who can handle more alcohol often work better (Kwon, 2014). Company-wide drinking is also a common practice, as many drink for stress relief. In fact, South Koreans drink the most hard liquor at 11.2 shots per week, which has been established as a higher risk alcohol for GC (Cakar & Kim, 2016). One prominent element of South Korean drinking culture is "poktanju," or consuming mixed drinks. These typically consist of beer and whiskey or beer and soju, allowing for higher alcohol consumption as well as quicker inebriation (Cakar & Kim, 2016). These social pressures and expectations that underlie South Korea's drinking culture lead to much higher incidences of GC, as many feel obliged to drink for reasons other than personal enjoyment.

While South Korea's population consumes more hard liquor, France's alcohol of choice is wine, which has been established as a lower risk to gastric cancer than liquor and beer. Along with their choice of alcohol, self-control and moderation in drinking are defining characteristics of French culture (Demossier, 2010). These two factors stand in stark contrast to South Korea's lifestyle of excess. France has also had a steady decline in alcohol consumption over the last several decades. The number of those who define themselves as "regular drinkers" has decreased while those who identify as "occasional drinkers" has increased (Demossier, 2010). The overall attitude towards alcohol in France has shifted from an alcohol-drinking society to one that chooses to be more sober. Individuals who do partake often gravitate toward higher quality wines, rather than "everyday wines" for taste rather than socialization (Demossier, 2010). This allows for an appreciation for the wine itself, rather than treating it as a supplement.

Along with cultural differences, social determinants contribute to differences in drinking within South Korea and France. Underage drinking is strictly prohibited by law in South Korea, though adolescents can still gain access to alcohol from family and friends (Asante et al., 2014). These underage habits are especially influenced by their parents' consumption patterns, particularly the father's (Asante et al., 2014). In a culture where the working class use alcohol heavily, the social support systems that surround children and teens promote unhealthy behaviors. There is also a difference in systematic support systems available in South Korea and France. One such organization is Alcoholics Anonymous, an international organization focused on achieving sobriety. There are currently thirteen branches of Alcoholics Anonymous in France compared to one branch in South Korea (Alcoholics Anonymous, 2020). Accessibility to resources can vastly influence overall alcohol consumption by destigmatising rehabilitation. Increasing the number of established support systems may contribute towards progress of SDG 3. The combination of differences in support system social determinants and contrasting drinking practices contribute to the disparity of GC in South Korea and France.

Healthcare in South Korea versus France

Effective healthcare and treatment is a vital component to decreasing any disease, but a lack of access poses a risk for developing NCDs, and even gastric cancer. Certain countries with high incidence or mortality of gastric cancer have specific barriers, and the quality of healthcare in a country may determine the outcome of a high or low GC rate. With proper healthcare, there can be earlier cancer detection screenings, higher quality treatment options, and overall more affordable care, so that everyone can receive treatment for GC. However, most countries may have room for improvement.

In South Korea, medical centers are less concentrated in rural areas. Many private care services are located in urban centers due to medical benefit maximization techniques, where both private and public medical companies attempt to maximize the benefits in a single area. By using techniques, such as proximity to pharmacies, a patient can walk a short distance to fill a prescription immediately. Because 79.7% of the South Korean population lives in urban areas, 92.1% of doctors and 90.8% of hospital beds are located in these regions. The low ratio of doctors to locations in rural areas causes issues for rural-living South Koreans to get early screenings for gastric cancer (Song, 2009). Also in South Korea, rural citizens have difficulties traveling long distances to medical centers to receive treatment. There is a high probability that rural families may not be screened as often for gastric cancer due to the long distance (Song, 2009).

In addition to the majority of medical care primarily located in urban areas, South Korea is becoming an aging population quicker than any other nation. There has been a rise in medical spending for chronic degenerative conditions in accordance with the increase in the aging population, which has been an immense social burden (Cho et al., 2004). Through extensive healthcare reform, the South Korean government has been attempting to reduce the financial strain, especially for the younger population (Song, 2009). Despite universal coverage of the population, financial protection and high out-of-pocket (OOP) payments have remained a key policy issue. The growing inequalities since the 1990s and the increasingly aging population have had a significant effect on the healthcare system and the health outcomes of the population (Kwon et al., 2015). Since the price of health insurance and OOP payments are so high, it discourages most South Koreans from getting early screenings for GC. The combination of a lack of rural area medical care and increased financial burdens for the aging Korean population may contribute to the country's high incidence and mortality rate of gastric cancer. It is crucial for South Korea to evaluate other countries' national healthcare systems, so that they can improve their own system.

Contrarily, France—with its low incidence and mortality rate—offers a variety of healthcare choices to patients because of its low degree of micro-management placed on healthcare workers and the higher population health status attained by the French system. The French healthcare system is also dominated by solo-based, fee-for-service, private practices for ambulatory care and public hospitals for acute institutional care in which patients are free to navigate and be reimbursed under National Health Institution (NHI) (Kringos, 2015). This covers both healthcare use and reimbursements after 2010 as well as hospitalization charges, outpatient treatment, and medication. As a result, France can persuade their citizens to get early medical screenings for GC, resulting in a higher survival rate due to early detection. Additionally, medical clinics are distributed in both rural and urban regions in France. French citizens in rural areas have the same access to medical care as those residing in urban cities and can visit medical centers in their vicinity, facilitating access to GC screenings. The creation of academic hospitals creates a duality in the French healthcare system between ambulatory care (with both specialists and generalists paid on a fee-for-service basis) and specialized, highly technical, and predominantly public hospital care (Kringos, 2015). While the French healthcare system does have its disadvantages just like any other healthcare system, its involvement in the treatment and prevention of gastric cancer remains striking compared to other countries.

Evidently, health coverage immensely differs between the two countries. Korean primary care services are located more in urban region centers. Contrarily, France has a thorough spread of medical clinics with universal coverage and a public-private mix of hospital and ambulatory care. France also has higher levels of resources and a

higher volume of service provision. The healthcare systems of countries with high incidence of GC need to improve in order to achieve SDG 3 by developing high quality healthcare for everyone. This issue also concerns SDG 10, as healthcare systems should strive to reduce inequalities between rural and urban populations, specifically by implementing equitable amounts of medical centers in these respective regions. It is important for everyone to have equal access to healthcare, and it is an important human right in which many countries need to work on implementing. This is necessary for progressing forward in the Sustainable Development Goals.

Recommendations

Through the evidence-based case study comparing South Korea (high GC incidence) and France (low GC incidence), specific interventions can be tailored to decrease premature mortality measured by the indicators of SDG 3, specifically. By decreasing risk factors of GC and implementing evidence-based interventions, about 30-50% of cancers can be averted (WHO, 2018).

Increasing Access to Healthy Food Options

France has implemented many successful nutrition programs that can be initiated in countries with a high prevalence of GC, such as South Korea. The Groupe d'Etude des Marchés Restauration Collective et Nutrition (GEM-RCN) involved in public catering in France established nutrition guidelines and 15 frequency criteria (FC) for 20 consecutive meals. This criteria was mandated in schools in 2011 and included specific proportions of raw vegetables or fruits, fish, cheese, dairy, etc. in meals. The French Nutrition and Health Program (PNNS) also had similar guidelines. Long-term compliance to these guidelines not only resulted in good nutrition in French school meals, but also favorable prognosis for cancer prevention (Vieux et al., 2018; Fysekidis et al., 2019). South Korea has also enacted programs including the School Meals Act of 2006 and Nutrition Teacher System. Although they do establish dietary guidelines, they are not as successful as France. Because the schools are in charge of implementing the program, this may lead to compliance issues, as some schools may not enforce these regulations. Also, for their Nutrition Teacher System, there is a low employment of nutrition teachers as a specialized degree is required (Yoon et al., 2012). In the past, there have been conflicts providing high quality foods at low prices as well. Overall, there is a lack of research on the efficacy and compliance of these programs unlike France. In light of these issues, it is necessary to establish national nutritional programs, guidelines, and standards with strong compliance in all schools and restaurants, as well as more research to monitor success.

Another successful project was conducted in May to November 2018, focusing on sodium reduction in Daegu, South Korea. The researchers partnered with 90 restaurants and reduced the sodium in 156 menu items by an average of 36.1%. They measured the sodium content and salinity of 889 participants before and after the project was completed. As a result, even while reducing sodium by over a one-third average, most participants still had a positive satisfaction rate and overall enjoyment of the foods (Ma et al., 2020). Based on the success of this project, sodium reduction campaigns should be enforced on a global scale. Communities without access to healthy foods are particularly vulnerable to GC, so their right to health has been violated. With strong government, school, and restaurant partnerships, nutrition programs and sodium reduction campaigns can be implemented in regions without accessibility to healthy food options, thereby progressing towards SDGs 3 (good health) and 17 (partnerships).

Shifting Attitudes toward Alcohol in Media

The promotion of alcohol in media and advertising increases the likelihood that adolescents will begin to consume alcohol, and to drink more if they had already started drinking (Anderson et al., 2009). Behavioral shifts can be attributed to unrealistic expectations of social norms, facilitated by advertisements. Specifically, advertisements

convey positive attitudes towards alcohol and normalize drinking to adolescents (Berey et al., 2017). South Korea was the only country among the Organization for Economic Cooperation and Development (OECD) that permitted practices such as putting pictures of celebrities on alcohol labels and bottles, until their recent ban in December 2019 (Movendi International, 2019). Advertisements featured popular Korean pop (Kpop) stars, which in turn glamorized intoxication and drinking to young audiences. Their campaign banned this kind of advertising in order to limit exposure to impressionable youth. These kinds of partnerships between governmental organizations and the media further progress SDG 17. South Korea specifically targeted their largest influences, Kpop singers, in order to create the most successful intervention. Globally, other countries can follow suit and identify the largest influences on their youth population. Another country that can utilize a similar approach is the United States where adolescents are most impacted by social media platforms and their respective influencers. Partnerships can focus on decreasing alcohol consumption by using social media influencers to present healthy habits to their large audiences. Young populations are especially vulnerable, compared to older individuals, to be impacted by alcohol advertisements that headline celebrities (Jernigan et al., 2017). As adolescents are coerced to partake in unhealthy behaviors, their right to health established by the Universal Declaration is violated. This recommendation seeks to decrease alcohol consumption in youth by establishing appropriate relationships with drinking at an impressionable age.

Spreading Access to Healthcare for Rural Populations

In terms of access to healthcare, countries with high rates of gastric cancer like South Korea should bring more attention to their healthcare system in order to provide earlier screenings, better coverage, and minimal financial burden. New Zealand had similar issues to South Korea but was able to address many of these problems. Their government now grants all New Zealanders equal health status regardless of residence in rural or urban areas, and maximizes the benefits of early intervention, proper coordination of care, health education, and group engagement in finding their own solutions to their health challenges (Steinhaeuser et al., 2014). New Zealand has a substantial spread of medical clinics throughout their country and places great importance on early prevention screenings and high quality treatment for cancer patients in general. New Zealand even has a medical airplane service known as the “NZ Flying Doctor Service” that can deliver medical care to the most rural areas; a doctor can visit a sick patient within a matter of minutes (O'Meara & Duthie, 2018). This is a great example of how a country can rectify obstacles in treating remote patients located in distant rural areas that require long travel. Historically, New Zealand had the same barrier of limited access to healthcare for their rural populations; however, they created an intervention that creatively solved the problem.

Many of these recommendations can be applied to not only the healthcare system of South Korea, but also to other high GC prevalent countries, which can help to lower premature mortality of GC and NCDs in general. Of 13,272 gastric cancer surgeries performed in Korea in 2005, 52.6% were performed in only five major hospitals (Park & Kim, 2008). South Koreans can spread more medical clinics across all areas of the country, so that those without access to clinics are able to see a physician without having to travel long distances. Also, the creation of a program that pairs newly admitted residents with experienced physicians during residency programs in distant rural areas would help with the spread of doctors across all of South Korea. It is important for countries to work together to contribute to achieving SDGs 3 and 10 by providing equal and accessible healthcare for all communities.

Measuring Progress to Monitor for Equity

The SDG Targets and Indicators are important tools for measuring progress and monitoring for equity before and after implementation of interventions in countries with a high incidence and mortality rates of GC. To measure progress of sodium reduction campaigns and nutrition programs on dietary lifestyles, SDG Indicator 3.4.1 can be used to measure

the change in mortality rate attributed towards NCDs. To measure progress of the media's influence on alcohol consumption, SDG Indicator 3.5.2 can be used to monitor alcohol per capita consumption. To measure progress in access to healthcare, SDG Indicator 3.8.1 can be used to calculate the coverage of health services. Monitoring these three SDG Indicators allows for the possibility to quantify outcomes of tailored interventions in order to contribute to the overall progress towards SDG Target 3.4 which aims to reduce premature mortalities attributed to NCDs by one-third by 2030 (United Nations, 2020). In addition to the SDG Indicators, another important aspect in measuring progress is through data collection. However, data should be disaggregated by demographics including sex, age, ethnicity, and even the specific type of gastric cancer. Thus, by collecting disaggregated data based on the SDG Indicators, there may be a wider understanding of GC and ability to identify shortcomings in interventions to improve future solutions.

Conclusion

Unhealthy diet, harmful alcohol use, and lack of access to healthcare are all risk factors for gastric cancer. There are many specific components in diet that increase GC risk such as high salt intake, fermented/pickled foods, and lack of fruits and vegetables. Alcohol consumption increases the risk for gastric cancer, particularly hard liquor. Limited access to healthcare and medical clinics obstructs the prevention and treatment of gastric cancer and NCDs in general. It is essential to tailor specific interventions in order to lower these risk factors, which in turn will hopefully lower incidence/mortality of GC and NCDs. There is a wide gap in health inequities across the globe, which is evident by the gastric cancer case-study on South Korea and France. Korea has the largest incidence of GC, which is aggravated by limited access to healthy options, finite knowledge about nutritional foods, its drinking and social culture, lack of medical access in rural regions, and financial burdens of health costs. France has one of the lowest incidence of GC, as they have strong compliance to mandatory nutritional programs, daily meal routines, decreasing alcohol consumption and higher-quality drinking, and one of the best healthcare programs in the world. These differences in South Korea and France illustrate a global disparity to health as a human right. The most vulnerable people of gastric cancer, and NCDs in general, are those without access to healthy food options, support systems for alcohol consumption, or access to healthcare services. There is a current dire need to take action in countries with high gastric cancer incidence and mortality, such as South Korea, in order to reduce health inequities, progress towards SDGs 3, 10, and 17, and achieve health as a human right around the world.

Identification of Areas for Further Research

Our extensive literature review was based on the most recent, significant findings despite some references being published over five years ago. Because our research is limited to literature review, there are many areas in which we can extend our research. Since France is becoming more diverse, while South Korea has a more uniform population, further research can dive into the effects of a heterogeneous versus homogeneous population and their prevalence of gastric cancer. There may be an assimilation effect on population and community health. We can also analyze the risk factors and social determinants in specific cities, towns, or rural regions within each country, or look into specific age groups and their severity of GC risk. More research can be done on the population opinion of health insurance coverage in France and South Korea in order to generate more problem solving solutions for many issues of health insurance especially with gastric cancer. Finally, with the current COVID-19 pandemic, we can also look into the effect of COVID-19 on countries with a high prevalence of GC.

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