Cancer Post-Hoc Comparative Analysis: GCC versus USA

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Abstract—In this paper, analytical study is dealing with cancer cases in Gulf countries and compares these cases to a developed country which is the United States, in this case, this study shows the evolution in dealing with cancer in Gulf countries and the US, and then compare Gulf countries to each other to clear if there is a difference between these countries, we found out a correlation between human development index and mortality rate, and we found out that all countries in this study indicated an improvement in dealing with cancer, and all countries showed a continuous improvement in human development index.

Keywords—Cancer, Human Development Index, Survival rate, Mortality rate, Incidence rate

1. Introduction

Cancer is a major public health problem and is the second leading cause of death around the world. Therefore, attempts are continuously carried out to provide a better understanding of the cancer incidence patterns and how the most common risk factors are implicated [1]. Due to lack of studies that consider cancer about Gulf Cooperation Council (GCC) countries, this study compares these countries with developed country like United States to show how development the health care system in GCC countries would go against one of the best health care systems out there.

Observing the changes on mortality rate with the passage of time, observing the changes on incidence rate, comparing GCC countries with each other and noticing the differences between them in each method that would use in this study, observing the impact of Human Development Index (HDI) on mortality rate with the passage of time to see if its good investment for countries that want to reduce the impact of cancer on their people and their economy, and finally, observing the people after they get the treatment and stay in contact with each one of them to recognize the effect of new medicines, and treatment techniques.

Other study focused on GCC countries only without taking a developed country as a benchmark [2]. The study used incidence rate as the only method and it included four years of data only, so to build on that. This study includes four methods, and data for more than 27 years in some aspects of the study, and all of that to be more accurate and to see the whole picture of cancer treatment and observation evolution in GCC countries.

The rest of the paper is organized as follows. Section II summarizes related work. Section III introduces the reader to the study methodology. Results and discussion are described in Section IV and finally Section V concludes the paper.

2. Related Work

Claudia et. al. [6] conducted a study that uses survival rate methodology to find the rate of people who survive five years after a cancer treatment. They found that survival rates are increasing in general, and in some types of cancers like breast cancer the survival rates were about 90% in Australia and United states, however, some countries recorded a way less rates like South Africa who recorded only 40%.

Amal et. al. [5] published a study that uses mortality rate between 1998 and 2007 in GCC countries and provided a detailed mortality rates about many types of cancer, and many countries including GCC countries. Salman et. al. [7] presented a study that uses Incidence rate methodology, the study observed the Incidence rate of breast cancer in GCC countries and noticed that the incidence rate of breast cancer in developed countries is higher compared to developing countries and talked about some preventative techniques such as tobacco prevention, doing some physical activities, reduction of obesity. Khoja and Zahrani [8] conducted a study that uses incidence rate as methodology and observed incidence rate of all cancer types recorded in GCC countries.

3. Methodolgy Used

This study uses multiple methodologies to have a different view from different angles of cancer treatment and prevention methods history in the GCC countries, and to reduce the bias that could happened when the study uses one methodology. The first one is incidence rate which shows the number of cases per year (100000 standardized). This indicates one of two things, first, the improving of cancer observation, and second, cancer prevention methods. Mortality rate shows the amount of people who did not make it per year (100000 standardized) which indicates the efficiency of cancer treatment. The higher the better, HDI which is an international standard used to show how developed a country is. It depends on health, education, and living standards. This study is going to dig to find if there is a correlation between HDI and mortality rate. This means maximizing the HDI would help in minimizing the mortality rate. Finally, survival rate which shows the ratio of survival people five years after of receiving treatment (5 years standardized) which indicates the quality of

the treatment and the post-observation of old patients. However, it is the hardest data to collect because patients continuously moving from country to another changing their phone numbers or take a treatment outside their home countries as well as that some people who do not want to share their personal data after the treatment.

4. Results and Discussion
4.1. Mortality Rate

All GCC countries and USA showed in this analytical report a general decrease in mortality rate between 1990 and 2017 except the UAE and Saudi Arabia which might be affected by the huge population increase compared to the rest of countries in this analytical report, however, UAE and Saudi Arabia showed general decrease in mortality rate between 2010 and 2017 which mean that these countries developed a new effective methods and techniques to deal with cancer cases.

It's worth to mention that Bahrain showed to highest decreasing rate, the mortality rate dropped by more than 50.5% between 1990 and 2017 which might be an outcome of a huge improvement of their health care system, and the development of Cancer awareness methods.

4.2. Mortality Rate and Hdi Correlation.

In this analytical report, all countries showed kind of negative relationship between mortality and HDI, the higher the HDI, the lower the mortality rate, which indicates the importance of maximizing HDI in those countries who want to reduce cancer impact. This negative relationship appeared more obvious in some countries more than other, in USA, Qatar, Bahrain, and Kuwait the negative relationship was clear which indicates that HDI strategies was balanced between the three HDI factors and specially Health care factor.

However, the relationship of the KSA, UAE, and Oman was not clear that much, which might be a result of unbalanced HDI strategies that focuses much more on education, and living standards or it might be an outcome to the more improvement medicine recording techniques, but the mortality rate of KSA, UAE, Oman, got back to decrease after 2012. We noticed that Kuwait HDI decreased after 1991 because of war with Iraq in that year and the drop of oil prices

which could affect on the governmental plans to increase the HDI.
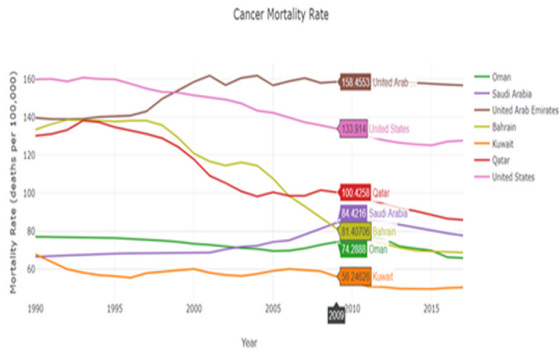

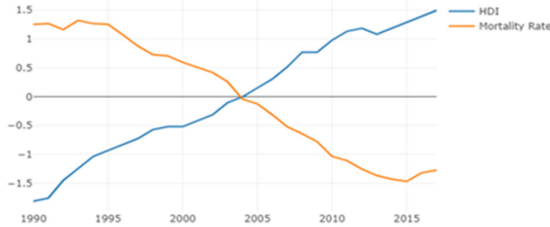Fig. 1. Cancer mortality rate.
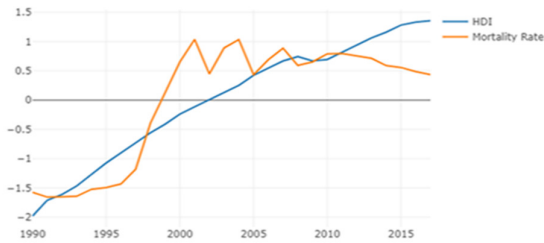

Fig. 2. USA mortality rate vs HDI.
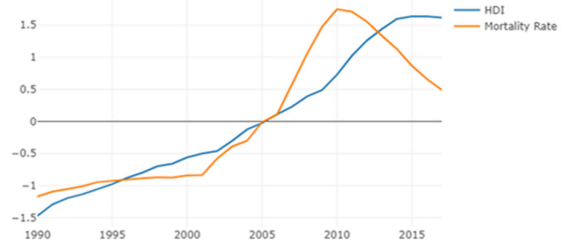

Fig. 3. UAE mortality rate vs HDI.

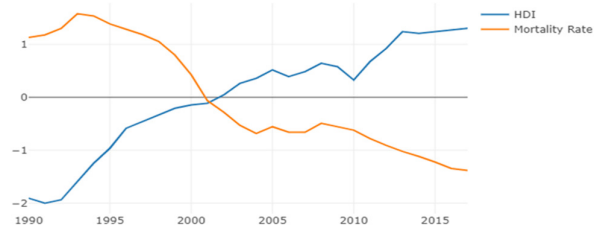Fig. 4. KSA mortality rate vs HDI.

Fig. 5. Qatar mortality rate vs HDI.

4.3. Cancer Incidence Rate

In general, USA has the Highest incidence rate of all countries in the report, which is the outcome of their more effective techniques of cancer observation, and it mean that USA did not improve effective techniques to prevent cancer yet.

The first type of cancer that we are going to discuss is breast cancer which is the most common type of cancer in the world, we could easily notice that USA has a significant higher incidence rate with 72.3 per 100000 which is about 1.5 to 5 times more than GCC countries and it might be result of the way higher alcohol consumption which is one of factors that would increase the possibility of getting breast cancer according to Mayo Clinic medical center [3].

However, we could notice that Bahrain has a way higher rate of lung cancer incidence compared to the other GCC countries which might be a result of their high tobacco production as well as consumption which is supported by Bahrain government.

USA has a huge colorectal cancer ratio which is 34.5 per 100000 for male and 26.6 per 100000 for female which is about 2 to 3 times more than GCC countries have and one of the mean reasons for is the African-American people who has more risk to get colorectal cancer because of their genes according to Mayo Clinic medical center [4].
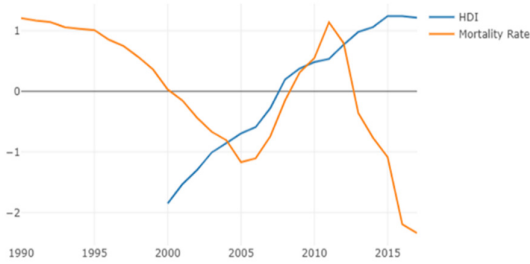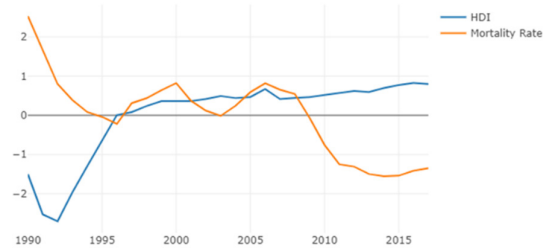

Fig. 6.   Oman mortality rate vs HDI.

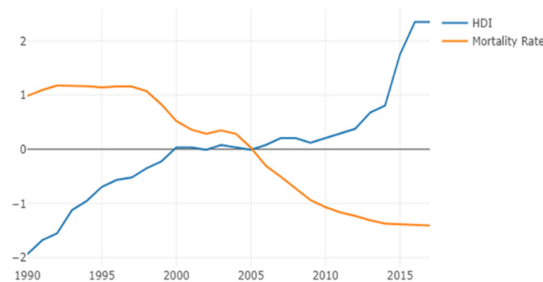

Fig. 7.   Kuwait mortality rate vs HDI.
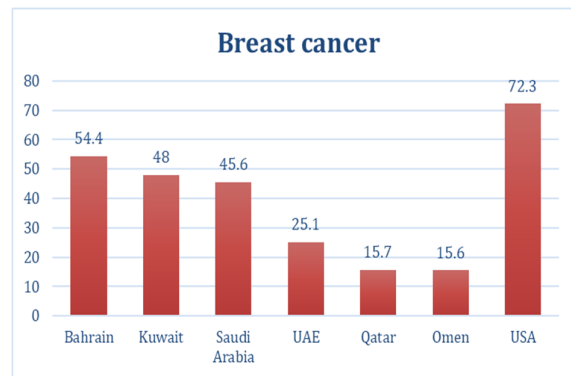

Fig. 8.   Bahrain mortality rate vs HDI.

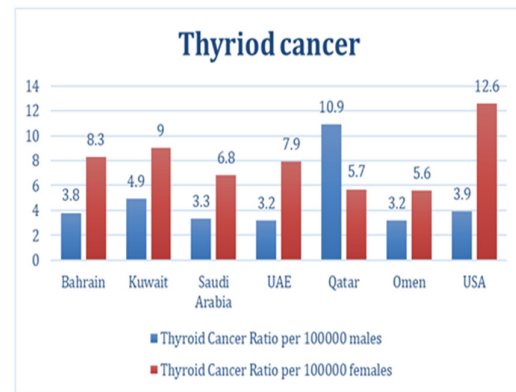Fig. 9.   Incidence rate of breast cancer
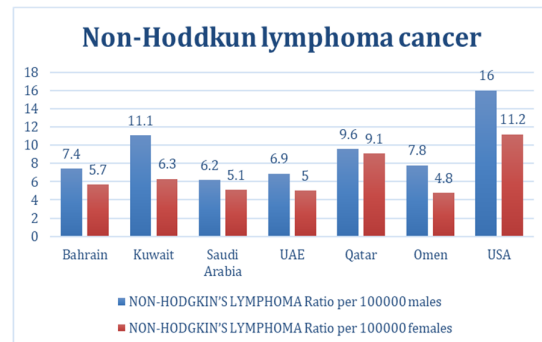

Fig. 10. Incidence rate of thyroid cancer

Fig. 11. Incidence rate of Non-Hodgkin lymphoma cancer

4.4. Cancer Survival Ratio

Cancer can affect human life after treating, so we decide to check the survival ratio five years after of treating (2010-2014), but such a methodology is harder to use, due to the lack of data, it's harder to get since you have to stay in contact with each patient for a long period of time, so we have a lack of data that serve our report decently, and the data we found was only for Kuwait, US, and Qatar, and we noticed the following, USA has the highest survival ratio among the countries in all cancer types which indicates how good USA health Care

System is, Kuwait and Qatar were now that far from USA survival ratio as well which indicates an improvement of their health care system as well.

However, Kuwait health care system does not have some good techniques to deal with colon cancer as Qatar and USA, Lung Cancer is the most dangerous and the harder to deal with and making a full recovery of among cancer types in this report because of low survival ratio that 75% of USA lung cancer patients and about 85% of Qatar and Kuwait patients lost their lives because of the lung cancer post-effects five years after the treating.

Lymphoblastic leukemia appeared as the easiest type of cancer in terms of dealing with, US, Qatar, and Kuwait, had a high survival ratio with 90%, 89%, 88% receptively, which are decent ratios.
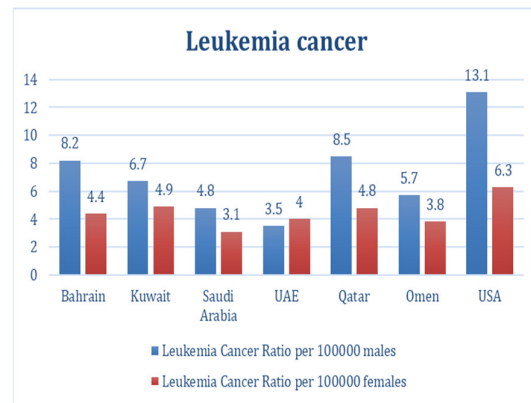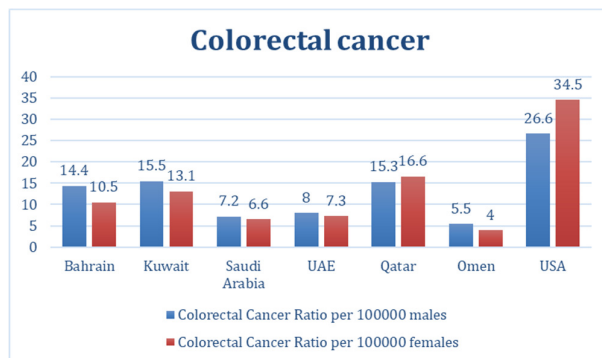

Fig. 12. Incidence rate of colorectal cancer.

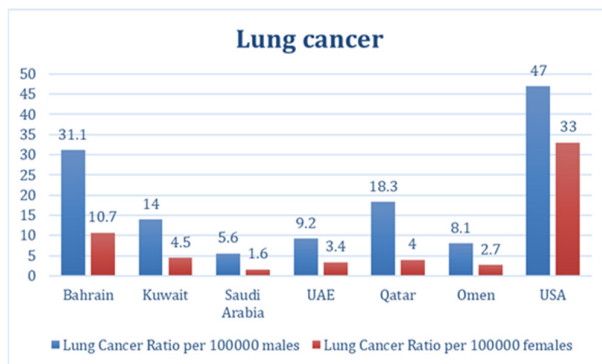
Fig. 13. Incidence rate of lung cancer.

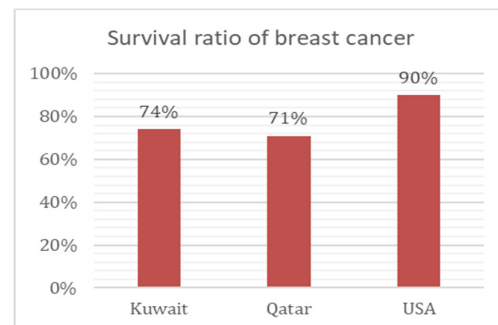Fig. 14. Incidence rate of leukemia cancer.

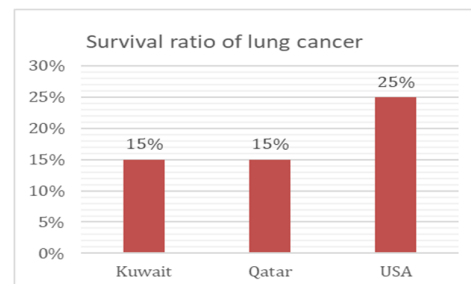
Fig. 15. Survival ratio of breast cancer.

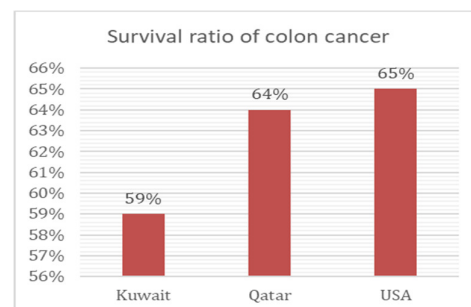Fig. 16. Survival ratio of lung cancer.

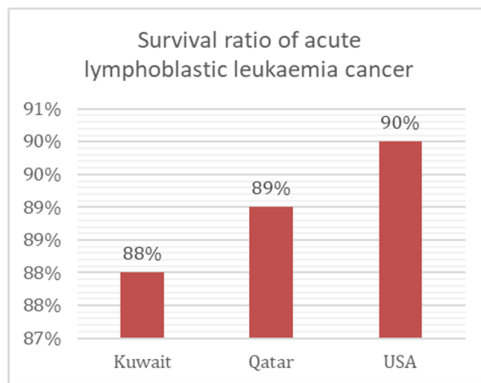Fig. 17. Survival ratio of colon cancer.

Fig. 18. Survival ratio of acute lymphoblastic leukemia cancer.

5. Conclusion

In general, GCC cooperation council countries showed a development in dealing with cancer, in terms of mortality rate, it decreased which indicates how much GCC countries work on improving their cancer treatment methods and techniques, incidence rate increased, which could indicate that their observation methods are dramatically improved, however, it indicated that their mean focus is cancer treatment but not preventing the cancer itself in the first place.

GCC countries show a decent survival ratio which in some cases were too close to catch up with United States survival cancer ratio, even with the fact that the data was not include all of the GCC Cooperation Council countries. And finally, this study found that there is a correlation between HDI and mortality rate, and it's worth to mention that GCC countries show a good improvement on HDI aspect as well.

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