



우리나라 2020년도 사망원인통계

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Cause-of-death statistics in 2020 in the Republic of Korea

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Background: This study analyzed the causes of death in the Korean population in 2020.

Methods: Cause-of-death data for 2020 from Statistics Korea were examined based on the Korean Standard Classification of Diseases and Causes of Death, 7th revision and the International Statistical Classification of Diseases and Related Health Problems, 10th revision.

Results: In total, 304,948 deaths occurred, reflecting an increase of 9,838 (3.3%) from 2019. The crude death rate (the number of deaths per 100,000 people) was 593.9, corresponding to an increase of 19.0 (3.3%) from 2019. The 10 leading causes of death, in descending order, were malignant neoplasms, heart diseases, pneumonia, cerebrovascular diseases, intentional self-harm, diabetes mellitus, Alzheimer disease, liver diseases, hypertensive diseases, and sepsis. Cancer accounted for 27.0% of deaths. Within the category of malignant neoplasms, the top 5 leading organs of involvement were the lung, liver, colon, stomach, and pancreas. Sepsis was included in the 10 leading causes of death for the first time. Mortality due to pneumonia decreased to 43.3 (per 100,000 people) from 45.1 in 2019. The number of deaths due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was 950, of which 54.5% were in people aged 80 or older.

Conclusion: These changes reflect the continuing increase in deaths due to diseases of old age, including sepsis. The decrease in deaths due to pneumonia may have been due to protective measures against SARS-CoV-2. With the concomitant decrease in fertility, 2020 became the first year in which Korea's natural total population decreased.

Key Words: Cause of death; COVID-19; International Classification of Diseases; Malignant neoplasms; Republic of Korea

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Introduction

1. Background

A series of cause-of-death statistics in the Republic of Korea in 2014 [1], 2016 [2], 2018 [3], and 2019 [4] has been published. Therefore, the present study is a follow-

up report on the same statistical data for 2020. In the 2019 data, a topic of particular interest was Alzheimer disease, which rose to the seventh leading cause of death [4]. In contrast, 2020 marked the start of the coronavirus disease 2019 (COVID-19). The overwhelming majority of Koreans protected themselves against COVID-19 by wearing KF-94 masks and practicing social distancing. It will be critical to analyze the causes of death during the pandemic period so that the results can be reflected in future public health policies. Furthermore, as the total fertility rate [5] has continued to decline, the net natural change in the total population is a concern to policymakers and physicians. The total fertility rate was 0.918 in 2019 and 0.840 in 2020. The number of births was 302,676 in 2019 and 272,337 in 2020 [5]. It was anticipated that the net change in the natural number of the population would reach 0% in 2020 or 2021, after which the total population of Korea will steadily decrease [3].

2. Objectives

The aims of this study are nearly the same as those of the previous report from 2014, 2016, 2018, and 2019—specifically, “examining the corresponding changes in the causes of death in the Korean population may provide some insights regarding how to cope with issues of public health and welfare” [1]. This report focuses on the number of deaths and the crude death rate, the number of deaths and mortality rates by age and sex, life expectancy, trends in mortality rates by causes of death, and deaths due to COVID-19.

Methods

1. Ethics statement

This study analyzed public data; therefore, neither

approval by the institutional review board nor the obtainment of informed consent was required.

2. Study design

This was a descriptive study based on public data by Statistics Korea. The study was described according to the STROBE statement, available at: <https://www.strobe-statement.org/>.

3. Setting, participants, data source, and measurement

The data collection and analysis methods were the same as those of the previous study on cause-of-death statistics from 2016 study [2] to the 2018–2019 studies [3,4]. Data were obtained from death certificates issued in 2020 for Korean people who had resided in the Republic of Korea [5]. The analysis and classification were done based on the mid-year population numbers, using the disease classification recommended by the World Health Organization [6] and the Korean Standard Classification of Diseases and Causes of Death (KCD-7 [7]). The data obtained from Statistics Korea are available in Data Set 1.

4. Variables

All causes of death were variables in analyzing the data. Major causes of death were emphasized.

5. Bias

There was no bias in collecting and analyzing the data.

6. Study size

The entire population in the Republic of Korea was included. No study size estimation was required.

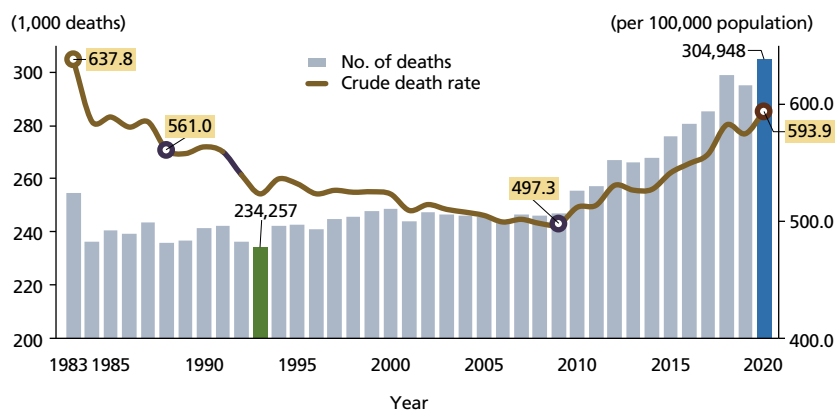


Figure 1. The number of deaths and the crude death rate from 1984 to 2020 in Korea.

7. Statistical methods

Descriptive statistics were applied to present the results of the data analysis.

Results

1. Number of deaths and crude death rate

In 2020, there were 304,948 deaths, reflecting an increase of 9,838 deaths (3.3%) from 2019 (Figure 1). The number of deaths in males was 165,163, which was an increase of 4,841 (3.0%) from 2019. The number of deaths in females was 139,785, which was an increase of 4,997 (3.7%) from 2019. The average number of deaths per day was 833, which was 24 persons more than in 2019 (Suppl. 1).

The crude death rate (the number of deaths per 100,000 population) was 593.9, corresponding to an increase of 19.0 (3.3%) from 2019. The crude death rate for males was 645.0, which was an increase of 19.0 (3.0%) from 2019. The crude death rate for females was 543.0, demonstrating an increase of 19.1 (3.6%) from 2019 (Suppl. 1). The age-standardized death rate, which reflects differences in age distribution, was 300.0, corresponding to a decrease of 5.4 from 2019.

2. Life expectancy

Life expectancy at birth in 2020 was 83.5 years, which increased by 0.2 years from that of 2019 (83.3). The life expectancy at birth for males in 2020 was 80.5 years, and that of females was 86.5 years [8].

3. Death according to sex and age

The number of deaths increased in age groups of 80 years and over (7.0%), 20–29 (5.7%), and 60–69 (4.2%) from 2019. The number of deaths in those aged 80 years and above comprised 48.6%, an increase of 1.6%p. The proportion of deaths in the age group of 80 and higher was 35.8% in males and 63.8% in females (Suppl. 2).

The mortality rate decreased in all age groups except for those in their 20s from 2019. The mortality rate by age (per 100,000 population) was the lowest in the age group of 1–9 years (8.6) and the highest among those over 80 (7,824.5). The sex ratio of mortality (male mortality/female mortality) was greater than 1, indicating male predominance, for all ages. The sex ratio was the highest (2.75) in the 60–69 age group (Suppl. 3).

4. Trends in death rates by leading causes of death

1) Leading causes of death

By rank, the 10 leading causes of death in 2020 were malignant neoplasms (cancer), heart diseases, pneumonia, cerebrovascular diseases, intentional self-harm, diabetes mellitus, Alzheimer disease, liver diseases, hypertensive diseases, and sepsis (Figure 2, Suppl. 4). The 10 leading causes of death in 2020 accounted for 67.9% of all deaths. Hypertensive diseases (ninth) and sepsis (tenth) rose by one level

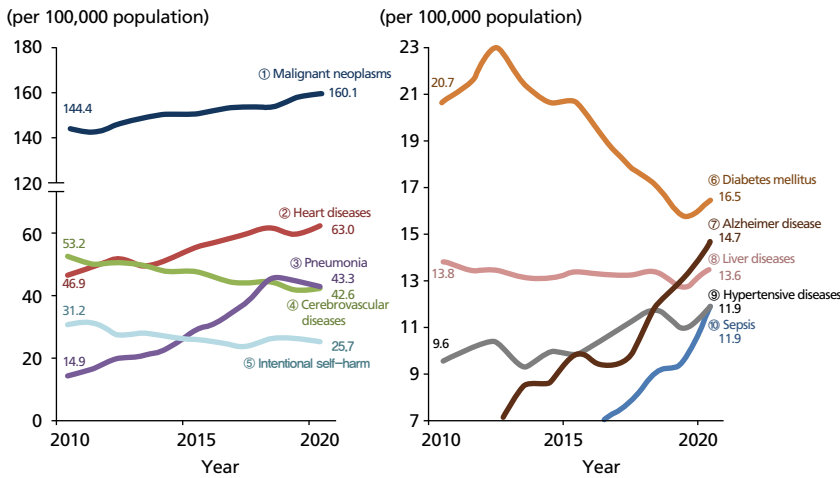


Figure 2. Trends in the mortality rates of the 10 leading causes of crude death from 2010 to 2020 in Korea.

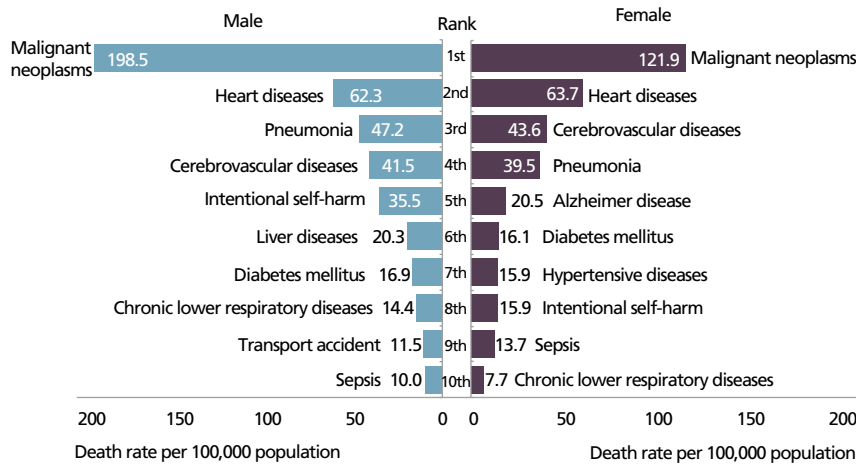


Figure 3. The 10 leading causes of death by sex in 2020 in Korea.

each from 2019. Among the 10 leading causes of death, the mortality rates due to the 9 leading causes have steadily increased, whereas the mortality rate due to pneumonia and intentional self-harm has decreased (Figure 2, Suppl. 5) since 2019. The 10 leading causes of death in males and females are presented in Figure 3. The ranking of causes of death in males was the same as that in 2019, whereas in females, cerebrovascular diseases became third and pneumonia became fourth, reversing their order from 2019. Intentional self-harm moved from sixth to eighth place. The leading causes of death according to

age group are presented in Suppl. 5. The top cause of death in the age groups of 10–19, 20–29, and 30–39 was intentional self-harm. In the age groups of 40–49 and over, the top cause of death was malignant neoplasms. Intentional self-harm was the second leading cause of death in the age groups of 40–49 and 50–59.

2) Mortality due to malignant neoplasms

The mortality rate from malignant neoplasms was 160.1 per 100,000 people, up 1.9 (1.2%) from 2019. The order of the cancer mortality rate according to the involved organ was the same as in 2019 (Suppl. 6). The mortality rates of prostate cancer (7.2%), pancreas cancer (5.9%), and breast cancer (3.8%) increased, and those of leukemia (–4.5%), cervical cancer (–4.3%), and stomach cancer (–1.5%) decreased from those in

2019 (Figure 4, Suppl. 7). The cancer mortality rate of males (198.5) was 1.6 times higher than that of females (121.9). The cancer mortality rate of males increased by 2.2 (1.1%) and that of females by 1.7 (1.4%) from that in 2019. The cancer mortality rate according to age in 2020 decreased by 10.7% for age group 60–69, 17.5% for 70–79, and 27.0% for equal to or more than 80 (Suppl. 8).

3) Mortality due to diseases of the circulatory system

The mortality rate of diseases of the circulatory system was 121.1, up 3.1% from 2019; this category primarily consisted of heart diseases (63.0), cerebrovascular

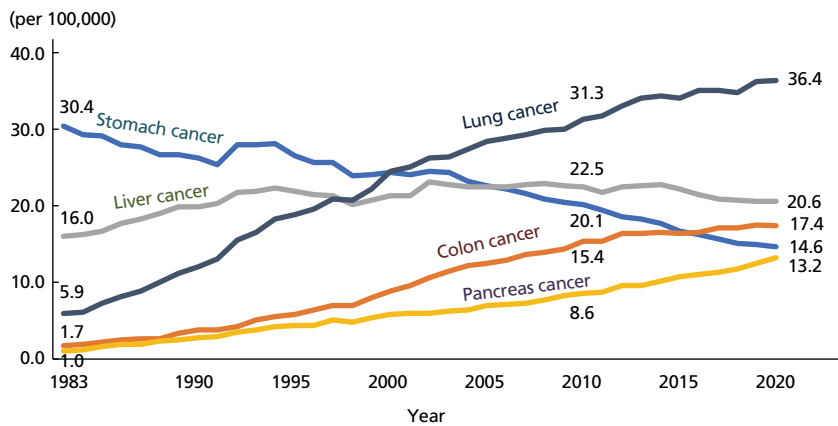


Figure 4. Trends in the mortality rate due to malignant neoplasms according to the involved organ from 1984 to 2020 in Korea.

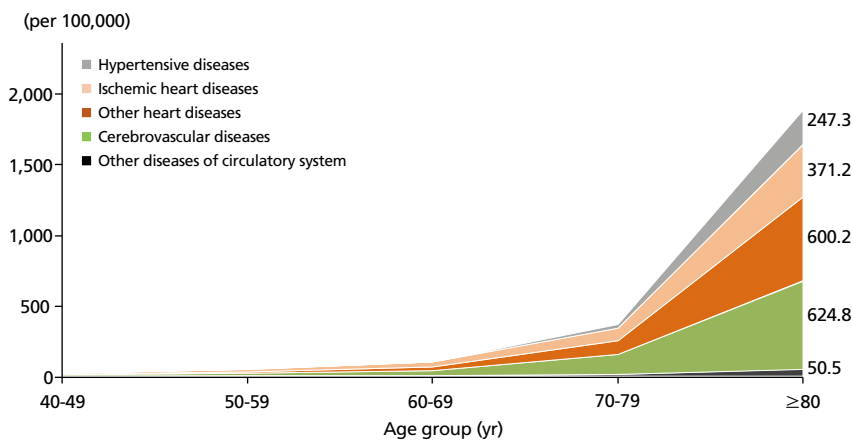


Figure 5. The mortality rate due to diseases of the circulatory system according to age in 2020 in Korea.

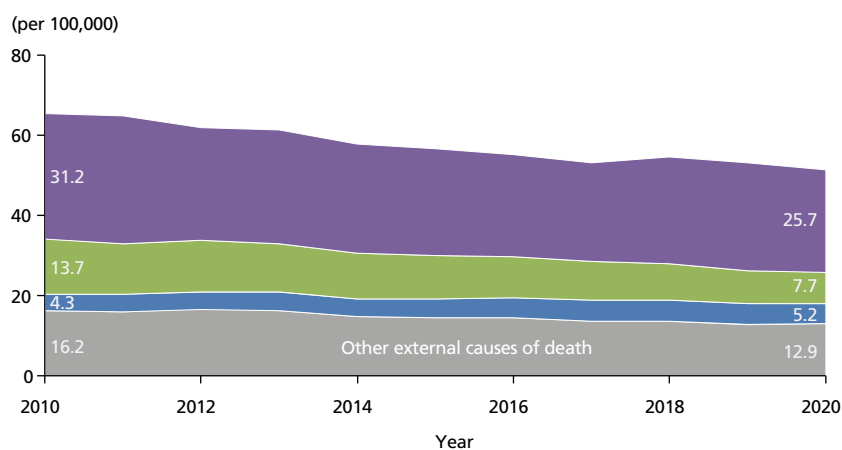


Figure 6. Trends in the mortality rate due to external causes of death according to the specific cause from 2010 to 2020 in Korea.

diseases (8.3%), cerebrovascular diseases (1.2%), and heart diseases (4.2%) increased. The mortality rate of diseases of the circulatory system was 1.1 times higher in females (126.7) than in males (115.5) (Suppl. 9). Mortality due to diseases of the circulatory system showed a trend of rapidly increasing with age, especially from the 70–79 age group, as was also observed in 2019 (Suppl. 10, Figure 5).

4) Mortality due to external causes of death

Of the total deaths, the proportion of deaths caused by external causes was 8.7%, down 0.6%p from 9.2% in 2019. The mortality rate of external causes was 51.5, down 3.1% from 2019. The ranking of external causes of death in terms of the mortality rate was as follows: intentional self-harm (25.7), transport accidents (7.7), and falls (5.2) (Figure 6, Suppl. 11,12). Deaths due to external causes were 2.2 times more common in males (70.4) than in females (32.7) (Suppl. 12). Within the category of external causes of death, intentional self-harm was the most common among all age groups except those under the age of 10 year-old (Suppl. 11). The total number of deaths caused by intentional self-harm was

diseases (42.6), and hypertensive diseases (11.9). Compared to 2018, mortality from hypertensive

13,195, a decrease of 604 (–4.4%) compared to 2019. The intentional self-harm mortality rate was 25.7, a

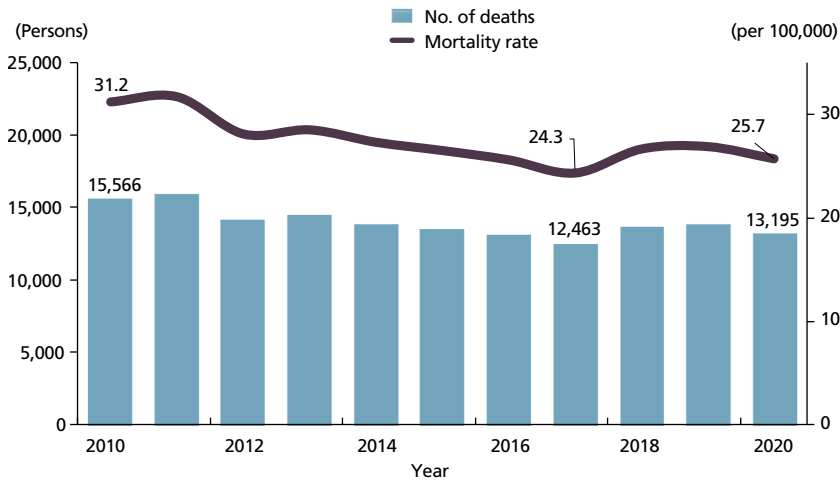


Figure 7. Number of deaths and mortality rate due to intentional self-harm from 2010 to 2020 in Korea.

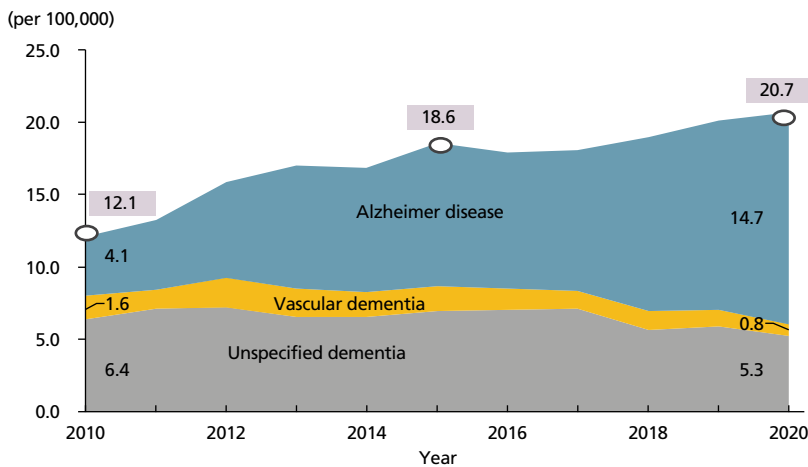


Figure 8. Trends in the mortality rate due to dementia according to the specific cause from 2010 to 2020 in Korea.

decrease of 1.2 (-4.4%) compared to 2019 (Figure 7, Suppl. 12,13).

Compared to the Organization for Economic Co-operation and Development (OECD) average of 10.9 people calculated from the latest data available in September 2021, Korea had the highest age-standardized intentional self-harm rate (23.5 per 100,000 OECD standard population) as of 2020.

5) Alcohol-related mortality

The total number of alcohol-related deaths was 5,155 (average 14.1 per day), reflecting an increase

by 461 from 2019. The alcohol-related mortality rate was 10.1, up 9.8% from 2019. The mortality rate of males in their 40s, 50s, 60s, and 80s decreased compared to 2018. Furthermore, the mortality rate of females increased in all age groups, except for those in their 70s, compared to 2018. The alcohol-related mortality rate was 6.1 times higher for males (17.3) than for females (2.8) (Suppl. 14).

6) Dementia-related mortality

For dementia deaths, only deaths caused by vascular dementia (F01), unknown dementia (F03), and Alzheimer disease (G30) were collected. The total number of deaths from dementia was 10,641, an increase of 2.7% from 2019 (Suppl. 15, Figure 8). The dementia mortality rate was 20.7, an increase of 0.5 (2.7%) compared to 2019. The mortality rate of dementia was 2.2 times higher for females (28.4)

than for males (13.0). Compared to 2019, dementia mortality rates increased in both males (6.9%) and females (0.9%).

7) Mortality due to COVID-19

Deaths caused by COVID-19 accounted for 0.3% (950 persons) of all deaths. The mortality rate due to COVID-19 was 1.9. It increased with age, and the mortality rate was 27.3 in those 80 years of age or older. The mortality rate of male in all age groups was higher than that of women. The monthly number of deaths is presented in Figure 9.

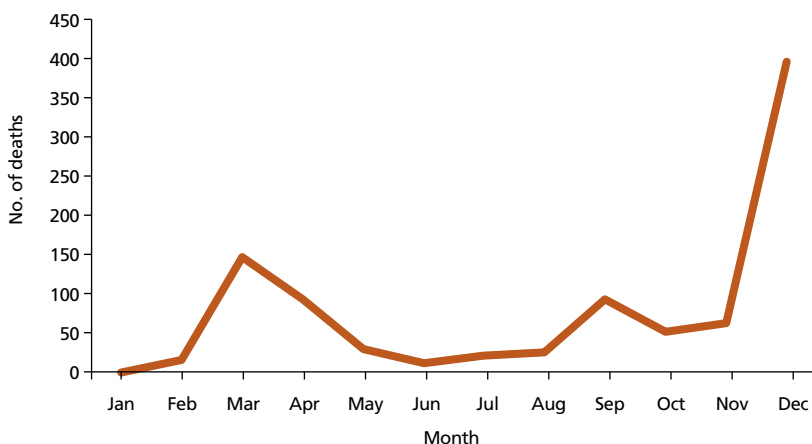


Figure 9. Monthly number of deaths due to COVID-19 in 2020 in Korea.

Discussion

1. Interpretation

1) Number of deaths, crude death rate, and life expectancy

The total number of deaths (304,948) in 2020 was the greatest since comparable statistics were first published in 1983 (Figure 1). The decrease in the total number of deaths in 2019 was an exceptional case due to the underlying effect of deaths in 2018 when the most deaths due to heat and cold waves since 2008 were observed [4]. Continuing annual increases in the total number of deaths have already been estimated because of the increase in the number of aged people. The proportion of the population younger than 30 years old in Korea has continuously decreased, whereas the proportion of aged people has increased, because of the rapid decrease in the total fertility rate, which was 1.05 in 2017, 0.98 in 2018, and 0.84 in 2020. These trends will not change within a short period. This trend can also be inferred from recent changes in the number of total births and deaths and the birth and death rates. The total number of births was 406,243 in 2016, 357,771 in 2017, 326,822 in

2018, 302,676 in 2019, and 272,337 in 2020, whereas the total number of deaths was 280,872 in 2016, 285,534 in 2017, 298,820 in 2018, 295,110 in 2019, and 304,948 in 2020. Therefore, 2020 was the first year of a net natural population decrease (32,611). This result had been previously anticipated.

The year 2018 was the first year that life expectancy did not increase since 1970 [3]. However, a follow-up report showed that life expectancy increased in both 2019 [4] and 2020.

2) Increased mortality rate due to malignant neoplasms

There was no difference in the ranking of the mortality rate due to malignant neoplasms by the involved organ from 2018 and 2019 (Figure 4, Suppl. 7). A steady increase in deaths due to cancers in Korea may be inevitable in the near future, and the above trends may be expected to continue (Figure 2). Stomach cancer can be a good target for quick reduction. For the primary prevention of gastric cancer, eradication of *Helicobacter pylori* and lifestyle modifications, including no smoking, no alcohol drinking, weight control, and low sodium intake are important. Gastric endoscopy is recommended for secondary prevention of gastric cancer [9]. As another example, the proper time for human papillomavirus vaccination is known to be 11 to 12 years old, before the start of sexual contact. Ideally, all girls aged 11 to 12 should be vaccinated in batches as part of the national mandatory vaccination project [10]. In 2016, the Korean government introduced human papillomavirus vaccination as part of its national vaccination program. As of 2022, all women aged

13 to 17 and low-income women aged 18 to 26 can be vaccinated for free. After the execution of this nationwide program, it is anticipated that deaths due to cervical cancer can be diminished dramatically.

The smoking rate of adults aged 19 or older was 20.6% (34.0% for males and 6.6% for females) in 2020 [11]. Therefore, to prevent malignant neoplasms related to smoking, men should take steps to adopt a healthier lifestyle. Stricter and stronger anti-smoking policies, including the policy of a smoking-free country, should be pursued to reduce deaths due to malignant neoplasms.

3) Mortality due to diseases of the circulatory system

The mortality rate due to diseases of the circulatory system increased by 3.3% in 2020 from 2019. It is evident that the decrease in deaths due to diseases of the circulatory system in 2019 reflects the underlying effect of the heat and cold waves in 2018 [4]. There were increases in mortality rates due to hypertensive diseases (8.3%), heart diseases (4.2%), and cerebrovascular diseases (1.2%) from 2019. Except for deaths due to cerebrovascular diseases, other causes of death will continue to increase due to westernized dietary practices and the adult smoking rate. More vigorous treatment for patients with hypertension is also required. The target blood pressure according to the guideline of the Korean Society of Hypertension varies according to the condition of the target population. It is 140/90 mmHg for the general population, including the elderly (65 years old and over), patients with diabetes mellitus; chronic kidney disease without proteinuria; and stroke or transient ischemic attack, whereas 130/80 mmHg is recommended for patients with chronic kidney disease with proteinuria; coronary artery disease; heart failure; and lacunar infarct [12].

4) Continued increase in intentional self-harm

The number of deaths due to intentional self-harm decreased by 604 (-4.4%) from 2019. Its mortality rate also diminished to 25.7, 1.2 (-4.4%), down from 2019. The mortality rate due to intentional self-harm decreased in all age groups 40 years and above, while it increased in those younger than 40. Aggressive welfare policies by the Korean government may alleviate the economic difficulties middle-aged and aged older adults. However, for young people, more intensive care policies are required.

Korea ranks first in the mortality rate due to intentional self-harm, with 23.5 in 2020, among 38 OECD countries, the average mortality rate due to intentional self-harm in the 38 OECD countries is 10.9 [13]. The Korean government and society should try their best to reduce this mortality rate to at most the average rate of the OECD countries within the near future. For example, legal restrictions should strictly prohibit reports of intentional self-harm by celebrities and politicians, and the families and colleagues of the deceased should be helped with frequent psychological or psychiatric support [14].

5) Surge of deaths due to sepsis

The death rate due to sepsis increased to 11.9 in 2020 from 9.6 in 2019, reflecting an increase of 24.1%. Its ranking was eighth in adults in their 70s and 80s and over. Of particular note, it was the sixth-highest cause of death in women in their 70s. Deaths due to sepsis may continue to increase because of the growth in the aged population. Early detection of sepsis with timely and appropriate interventions increases the likelihood of survival for patients with sepsis [15].

6) Mortality rate due to the COVID-19 pandemic

In total, 950 deaths caused by COVID-19 were recorded in 2020. This number includes both deaths

caused by COVID-19 with virus confirmed (U07.1) and deaths caused by COVID-19 with no virus confirmed (U07.2). Domestic deaths due to COVID-19 were counted based on death certificates. Therefore, there is a difference in the number of deaths from the Korea Disease Control and Prevention Agency's annual infectious disease monitoring figures. In other words, it only targeted Korean citizens, residents in the Korean territory, and those living in foreign countries (excluding foreigners). According to the data from the Korea Disease Control and Prevention Agency, the number of people diagnosed with COVID-19 was 61,769 in 2020 and the number of deaths due to COVID-19 was 917 (1.48%). This relatively small number of deaths was made possible by the Korean government's and people's efforts to overcome this new pandemic. Wearing face masks, frequent hand-washing, avoiding face-to-face meetings, and social distancing were simple but effective measures to prevent the large-scale spread of the causative virus. Very informative and precise guidelines helped to establish the government's policy to prevent this pandemic [16]. Furthermore, adequate measures to protect health personnel from COVID-19 were also put in place from the beginning of the pandemic [17].

2. Limitation

This study has no limitations because it presents statistics from the entire population of the Republic of Korea.

3. Suggestion

A follow-up report is necessary to confirm the predictions made in this report. In particular, reports of deaths due to COVID-19 will be a major concern, with

the goal of identifying the number of excess deaths due to COVID-19.

4. Generalizability

These results can serve as a prediction for rapidly developed countries. In particular, these findings are from a country where the medical service system is excellent, so that the threshold for visiting physicians and specialists is negligible. The causes of death in those 80 years old and over may also be of interest for other countries to predict the burden of medical care.

5. Conclusion

In 2020, the inclusion of sepsis in the 10 leading causes of death for the first time was noticeable. It was the sixth leading cause of death among women in their 60s, and deaths due to sepsis are expected to continue to increase. Korea's mortality rate due to intentional self-harm is still the first out of the 38 OECD countries. To reduce mortality due to intentional self-harm, Korean society faces the urgent task of establishing more aggressive strategies to prevent and reduce intentional self-harm, especially in young age groups.

찾아보기말: 사망원인; 코로나바이러스병19; 국제사인분류; 악성종양; 대한민국

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Conflict of Interest

No potential conflict of interest relevant to this article was reported.

Data Availability

A data file is available from Harvard Dataverse: <https://doi.org/10.7910/DVN/TEKYDG>

Data Set 1. Data on causes of death provided by Statistics Korea.

Supplementary Materials

Supplementary materials are available from Harvard Dataverse: <https://doi.org/10.7910/DVN/TEKYDG>

Suppl. 1. Number of deaths and crude death rate from 1984 to 2020 in Korea

Suppl. 2. Number of deaths by sex from 2010 to 2020 in Korea

Suppl. 3. Mortality rate according to age and sex in 2010, 2019, and 2020 (per 100,000) in Korea

Suppl. 4. Trends in causes of death and their proportions in 2010, 2019, and 2020 (per 100,000) in Korea

Suppl. 5. Mortality rate and its proportion by cause of death and age in 2020, Korea (per 100,000) in Korea

Suppl. 6. Trends in the mortality rate due to malignant neoplasms according to the target organ in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 7. Trends in the mortality rate due to malignant neoplasms according to the involved organ from 1983 to 2020 in Korea (per 100,000 population, %)

Suppl. 8. Mortality rate due to malignant neoplasms according to target organ and age in 2020 in Korea (per 100,000 population, %)

Suppl. 9. Trends in the mortality rate due to diseases of the circulatory system according to sex in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 10. Trends in the mortality rate due to diseases of the circulatory system according to age in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 11. Trends in the mortality rate due to external causes of death according to age in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 12. Trends in the mortality rate due to external causes of death according to sex in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 13. Trends in the mortality rate due to the intentional self-harm according to sex and age in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 14. Trends in the mortality rate due to alcohol-related diseases according to sex in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

Suppl. 15. Trends in the mortality rate due to dementia according to sex in 2010, 2019, and 2020 in Korea (per 100,000 population, %)

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Peer Reviewers' Commentary

이 논문은 통계청 자료를 기반으로 2020년도 우리나라 사망원인의 변화양상과 추이를 분석하여 설명해 주고 있다. 한 해 사망자 수는 30만 명이었는데, 이는 1983년 통계 이래 최고의 숫자이며, 사망자 중 80세 이상 고령인구 비율의 증가가 두드러진다. 사망원인의 변화를 보면, 악성신생물, 순환기계 질환, 치매 등에 의한 사망률이 계속 증가하고 있다. 사고사 등에 의한 사망률은 전년도에 비해 감소했으나, 자살과 같은 고의적 자해에 의한 사망률은 여전히 OECD 국가 중 1위이다. 패혈증에 의한 사망률이 최근 급증하는 추세도 보여주고 있다. 코로나19에 의한 사망자는 950명으로 남성과 고령일수록 사망률이 높았다. 폐렴에 의한 사망률은 전년도에 비해 감소했는데, 개인보호장비 착용과 위생 등에 의한 영향으로 해석된다. 사망원인의 변화추세는 인구고령화, 생활습관 변화, 신종감염병 출현 등의 영향을 의미하고, 만성질환 예방과 관리대책이 중요함을 잘 제시해 주고 있어 우리나라 보건 의료정책을 수립하는 데 좋은 정보를 제공할 것으로 판단된다.

[정리: 편집위원회]