Malignant Neoplasms in Serbia - Epidemiology, Risk Factors, Prevention

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ABSTRACT

The paper deals with the analysis of the incidence and mortality of malignant neoplasms in Serbia. The study aimed to present the epidemiological situation regarding malignant diseases in Serbia, in comparison with some relevant data from around the world, and to provide an overview of the possibility of preventive interventions. In this paper, only publicly available data was used from The Population Register for Cancer of the Republic of Serbia, the WHO, and the work of other researchers. All data were used according to established best practices in research.

It was concluded that malignant neoplasms rank second in terms of morbidity and mortality in Serbia. The incidence of malignant tumors by location is the highest for lung and bronchial cancers in men, and breast cancer in women. Notably, the morbidity rate in Serbia is lower compared to Western Europe, while the mortality rate is significantly higher.

The cause of such outcomes certainly lies, at least partially, with certain risk factors and the lifestyle choices associated with them, but also in poorer material conditions. Material conditions are directly related to the level of health care development. It is necessary to focus efforts on the reduction of risk factors, the promotion of healthy lifestyles and the improvement of health care in general, which is a basic human right.

Key words: malignant neoplasms, smoking, cancer register

INTRODUCTION

The primary goal of our study is to present the morbidity and mortality rates of malignant neoplasms in Serbia. Furthermore, our secondary goals include the presentation of a comparison of those statistics with the findings of other researchers and data from the WHO. Additionally, our tertiary goal involves the presentation of preventative measures that could reduce the incidence of illness and mortality from malignant disease, as well as those currently being employed in the Republic of Serbia. All of these goals have the aim of strengthening the fight against cancer in Serbia by enhancing preventative measures and improving the understanding of associated risk factors.

Epidemiology

Every year more people fall ill due to malignant diseases. According to data from the World Health Organization, approximately 10 million people died worldwide from some form of malignant disease in 2020. This statistic suggests that one in six deaths in that calendar year was caused by some type of malignant disease (1). In 2020, there were 20 million new cases of malignant disease, according to the same source (2). The WHO reports that the most common types of cancer are lung, breast, colorectal, and prostate cancer. Projections based on data from 2017-2019 indicate that approximately 40% of people will be diagnosed with some form of cancer during their lifetime (3).

Malignant neoplasms are the second leading cause of mortality and morbidity in Serbia and globally. The increasing trend in morbidity and mortality due to malignant diseases began during the so-called epidemiological transition, which occurred at the end of the 19th and the beginning of the 20th century (4,5).

Risk Factors

Malignant neoplasms present as an uncontrolled growth of cells, which exhibit a different pattern of growth and behaviour as compared to healthy cells of the same tissue origin. This phenomenon has been identified as a genetic disorder, which leads to the inactivation of the apoptosis genes, resulting in the formation of a neoplasm. It is believed that only 10% of malignancies are directly caused by disorders at the genetic level, while 90% are

the result of individual behaviour and/or the influence of various environmental factors. Although the pathophysiological mechanisms of action of malignant diseases are not fully understood, it has been determined that most malignant diseases can be prevented (5).

The risk factors for malignant disease have been well established. In addition to general environmental factors and food, such as radiation, various types of contamination, diets high in animal fats, and artificial chemical additives, a significant risk factor for the development of malignant diseases is unhealthy lifestyle habits.

Prevention

Prevention is the most effective approach to combating malignant diseases. Since the most common malignancies are caused, at least in part, by risk factors that can be prevented, it is incumbent upon society to implement preventive measures at all levels and throughout all segments of the population.

Serbia has operated a cancer registry since 1970, and in 1998, it was admitted into the International Association of Cancer Registries (IACR) and the European Network of Cancer Registries (ENCR).

Over the years, Serbia has implemented various strategies to try to control the rise in malignancies and the risk factors associated with them.

Note: Data from AP Kosovo and Metohija were not included in the cancer registry.

METHODS

For this paper, the following sources of data were used: the Population Register for Cancer of the Republic of Serbia; the Institute of Public Health of Serbia, "*Dr. Milan Jovanović-Batut*"; the Institute of Statistics of the Republic of Serbia; the WHO; and the Program for the Improvement of Cancer Control in the Republic of Serbia (*2020-2022*).

Included in our research is data regarding the incidence of illness and mortality from malignant diseases. Our team of researchers had no exclusion criteria because our research mainly consisted of a comprehensive review of available literature and public registers, and there was no direct contact with patients themselves. Data were gathered retrospectively.

When it comes to data from the Population Register for Cancer of the Republic of Serbia and the Institute of Public Health of Serbia, only data from available publications were used. The following data were included: the distribution of malignant diseases according to sex, the most common types of malignant diseases and comparative data regarding world trends in malignant diseases. As there was no access to the private personal data of patients, such as names, surnames, addresses and other identification information, there was no need for special authorization for the handling of such data from an ethics committee. All of the data in question were publicly available and handled according to established best practices in research.

Additionally, all data from other researchers and the WHO were handled according to established best practices in research, even though this data was also publicly available. The right of patients to the privacy of their personal data was never infringed upon during our research.

RESULTS

Like many parts of the world, Serbia is experiencing a steady increase in the number of patients being diagnosed with and dying from malignant diseases. Currently, in Serbia, approximately 37,000 people are diagnosed annually with malignancies of which some 21,000 cases have a fatal outcome (8). The global incidence of malignant disease is consistently and constantly increasing. It is expected that this trend will lead to a 70% increase in the prevalence of malignant disease by 2040.

The available data for AP Kosovo and Metohija, covering the period from 2004 to 2013, shows an incidence of 117.92 per 100,000 malignant diseases (9).

In 2021, the highest incidence of malignant tumors by localization was lung and bronchial cancers in men, and breast cancer in women (10,11). Figure 1 shows the leading localizations of malignant diseases in men, and figure 2 shows the same statistic in women.

Mortality from malignant neoplasms is increasing year by year. The average mortality rate for the population in 2021 shows figure 3 (10).

The leading localizations of malignant disease in cases where the health outcomes were patient death are largely consistent with the leading localizations in patient morbidity (figures 4 and 5).

It is important to note that the overall morbidity from malignant tumours in Serbia is lower than in Western Europe, but that the mortality rate is higher. Men in Serbia have the second highest lung cancer incidence and mortality rate in Europe, just below men from Hungary (8,12).

In 2021, 41,784 people fell ill (22,333 men and 19,451 women). In the same year, 19,979 people of both sexes died from cancer, and of those 10,974were men and 9,005 were women (12).

DISCUSSION

The leading localizations for malignant tumors in the Republic of Serbia according to morbidity and mortality do, in part, match the data from the World Health Organization. According to the WHO, the most common types of cancer are those of the breast, the lungs, the colon and rectum, and the prostate (1). According to the same source, the most common cancers in 2020 are the ones listed above with almost 8 million new cases reported that year. It should be noted that complete data for 2021 has not been compiled yet so as to be comparable with our research data. When it comes to mortality rates, as per the same source, lung cancer is in first place followed by colon, liver, gastric and breast cancer. This is the data that we have come to confirm through our own research as well, insofar as the leading localizations according to morbidity and mortality are concerned. In the case of men, the leading cancer localizations are the lungs, the colon and rectum, and the prostate. In the case of women, the leading cancer localizations are the breast, the lungs and the colon and rectum.

According to Dyba et al., breast, colorectal, prostate and lung cancer account for approximately half the burden of cancer cases in Europe (13). Data from other European countries as well as local regional countries bear the same trends. In Germany, according to data from the Center for Cancer Data, the most common malignancies are breast, colorectal, lung and prostate cancers. This closely matches the local data from Serbia, except for the fact that approximately half of the cases are comprised of breast cancer (14). For the sake of comparison, in Slovenia since the turn of the last century, the leading malignancy in men has been lung cancer until it was overtaken by prostate cancer (15). Over 60% of the malignancy cases in Slovenia are comprised of the following types of cancer: non-melanoma skin cancer, lung cancer, colorectal cancer, breast cancer and prostate cancer (16). Except for skin cancers, the rest of the localization rates align with the most common malignancies found in Serbia.

According to data from the WHO, in Bosnia and Herzegovina, a neighbouring state, the leading malignancy localizations are the same as in Serbia, i.e. the colorectum, the breast and the prostate (17). According to the same source, lung cancer stands at a rate of 23.7% of the total number of cases of malignancies in men, and at a rate of 8.9% of the total number of malignancies in women. The respective rates for lung cancer in Serbia are 21% for men and 10.7% for women. Breast cancer in women stands at a rate of 24% of all malignancies in women. The same breast cancer statistic stands at 23% in Serbia.

Although the world has recorded improving trends when it comes to both morbidity and mortality from malignant neoplasms, it is quite worrying that the mortality rate from malignant neoplasms is increasing in Serbia. The statistically increasing disease and mortality rates from malignant neoplasms are certainly caused in part by increasing life expectancy and the development of novel medical technologies. Today, many more diagnostic procedures are available to people, however, they obviously have their organizational and objective limits. Preventive measures should be the main priority in the fight against malignant diseases.

Comprehensive action by both the system and the individual at their respective levels is required. A greater investment of resources and the systematic implementation of preventive, diagnostic, and therapeutic measures and protocols are both expected and desired from the system and the community at large. Additionally, a strengthening of the healthcare system and a greater availability of medical care would, in part, bring Serbia closer to the standards set by more developed countries insofar as malignant neoplasms are concerned.

Likewise, everyone must take responsibility for his or her health and well-being and take steps to correct unhealthy habits to reduce the incidence of both disease and death.

The most important risk factors for malignant disease are preventable (4,5,18). It is believed that most malignancies can be prevented by changing poor lifestyle habits and avoiding lifestyle-related risk factors. More than 80% of malignancies can be influenced by avoiding and/or modifying the effects of various risk factors. Nearly two-thirds of all deaths from malignancies are attributable to five preventable risk factors: smoking,

alcohol consumption, poor diet, obesity, and lack of physical exercise. Of course, there are a few other risk factors to consider. Some of these are easier to mitigate, while others are far more difficult to handle. Examples of such risk factors include the following: excessive sunlight exposure, exposure to smoke and fumes generated in production processes or from the burning of fuels in fireplaces and vehicles, aflatoxin present in food, carcinogens in the workplace, various forms of radiation, and numerous infectious agents. According to the WHO, 30-50% of all current malignancies could be prevented with the adoption of and adherence to adequate preventative measures. Unfortunately, this list is not exhaustive, and many more items could be included.

Smoking is the most important preventable risk factor. Tobacco is believed to be the cause of the deadliest epidemic in modern times. Quitting smoking and avoiding it would save more lives than any other public health measure. The number of smokers in Serbia is estimated to be at rates of 27-40% of the total population. The value of this statistic depends on thereof sampling and the method of examination used in gathering the data. In Serbia, approximately 15,000 people die annually from diseases caused by smoking. In Serbia, there is also a law on the protection of the population from tobacco smoke, but it is a question of its compliance.

Vaccines can reduce the risk of cancer due to infection, e.g., hepatitis B virus, human papilloma virus. It is known that infection with Helicobacter pylori is associated with the development of gastric cancers, thus, treating the infection is a measure of prevention of malignant disease. According to data from the WHO, approximately 13% of all malignancies are linked to certain infections (H. Pylori, Hepatitis B, Hepatitis C, HPV, EBV).

Currently, vaccination for Hepatitis B is mandatory for newborns and certain at- risk populations, such as health workers, residents of institutions for the developmentally disabled, people on hemodialysis. In Serbia, approximately 300 people get sick with hepatitis B every year (19). As of the date of this article, approximately 32,000 children have been vaccinated against HPV, of which 77% are girls. It must be noted that this current rate of vaccinations is not at satisfactory levels.

According to data from Santibanez et al., certain goals in cancer prevention could be met with chemopreventive measures, i.e. with the utilization of certain, natural or synthetic, chemical agents (20). According to the same source, arctiin from the Artium Lappa plant has shown the ability to cause certain antitumor effects. In vitro, it successfully inhibited C100A4, an inflammatory protein shown to have links to the progression of malignancies and their metastasis. According to data from the National Cancer Institute, beside the standard measure of prevention of the removal of avoidable of risk factors, a certain amount of success in the prevention of cancer has been achieved with the regular use of small doses of acetylsalicylic acid (21). These are certainly domains in which there is still a great need for more valid data, but they are, nonetheless, domains worthy of further research and special attention.

Legislation must be designed to support healthy lifestyles. Strict enforcement of such legislation is necessary to minimize exposure to such risk factors. It is also necessary to create a healthcare system with better organizational and human resource policies. Such improvements would lead to a more equitable allocation of resources, and to an improved ability by the healthcare system to treat an ever-growing number of patients. Investment in the diagnosis and treatment of malignant neoplasms should be a priority for any modern healthcare system. A multidisciplinary approach to the diagnosis and treatment of malignant neoplasms is the foundation of any such goals.

Additionally, it is necessary to develop palliative care and psycho-oncology in conjunction with specific oncological treatment. This kind of medical care and support for oncological patients and their families is vital in overcoming the difficulties caused by cancer and improving the quality of life of patients and their families. In Serbia, palliative care exists only through primary healthcare centres, a few departments in general hospitals, and in one hospice.

Finally, a comprehensive expansion of facilities dealing with pediatric oncology is also a necessary part of any plan aimed at the improvement of oncological medicine within a national healthcare system.

Early diagnosis and adequate therapy, along with conscientious care given to those already diagnosed with a malignant disease, can also reduce the number of people suffering from cancer. Three screening programs arecurrently implemented in Serbia - breast cancer screening, cervical cancer screening and colorectal cancer screening (22). If one considers the afore mentioned statistical data,it may be concluded that the number, type and scope ofimplemented screening programs in Serbia is not satisfactory. It is the opinion of the authors of this article that there needs to be a significant expansion of the current screening list. Furthermore, there also needs to be a concerted and systematic effort to motivate people to attend screening tests regularly.

According to data from the European Commission, 80% of women underwent screening only in Denmark, Finland and Sweden. Over 70% of women underwent screening in Slovenia, the Netherlands, and Iceland, while in Estonia, Croatia, and Czechia, the rates of screening were just above 60% under the cited screening program (23). According to the same source, the rate of women screened for breast cancer globally amounted to just 6.1% in 2022.

Data regarding the screening of women for cervical cancer suggests a high rate of screening in Sweden and Norway, with a screening rate just slightly below 80%. In Czechia, Iceland, Finland, and Slovenia, the screening rate was above 70% (24) Unfortunately, Serbia, along with Romania, is in last place when it comes to the screening of women for cervical cancer with a screening rate of just about 5%.

Screening rates for colorectal cancer, according to data from the European Commission, show that almost 80% of people were screened in Finland, while Norway, Sweden, and Denmark followed with screening rates above 60%. According to this data, Serbia is again in last place with screening rates below 5% (25).

As a percentage of GDP, Serbia allocates more than many European countries, but in monetary terms, this allocation is insufficient, because the GDP is low (26). Likewise, a crucial factor in this phenomenon is the insufficient number of health workers, which negatively impacts both this trend and these statistics (27). Serbia is one of the countries with the largest share of citizens with unsatisfied health needs, with 7.6% (28). This is data from 2014. and it is necessary to continue monitoring this segment.

CONCLUSION

The reasons for higher mortality rates from malignant neoplasms in Serbia is partly due to the incidence of late diagnosis of the disease. It is likely that the lack of ubiquitous health services (diagnosis and treatment) in many areas of the country are responsible for this trend. We must also work on raising people's awareness of the importance of avoiding risk factors, through primordial and primary prevention, in the first place.

REFERENCES

1. WHO, official website, available at: https://www.who.int/news-room/fact-sheets/detail/cancer
2. WHO, official website, available at: https://www.who.int/news/item/01-02-2024-global-cancer-burden-growing--amidst-mounting-need-for-services#:~:text=In%202022%2C%20there%20were%20an,women%20die%20from%20the%20disease
3. National Cancer Institute, official website, available at: https://www.cancer.gov/about-cancer/understanding/statistics
4. Epidemiology, Students book, University of Belgrade, Medical School, 2006.
5. Harrison's principles of internal medicine, 19th edition, Data status, Belgrade, 2021.
6. International Agency for Research on Cancer, official website, available at: https://gco.iarc.who.int/causes/obesity/tools-bars
7. International Agency for research on Cancer, official website, available at: https://gco.iarc.who.int/causes/alcohol/tools-multi-bars?mode=1&sex=0&population=900&population_group=2&country=4&continent=0&cancer=40&key=paf&lock_scale=0&nb_results=20&age_group=3&stacked=expanded
8. The program Cancer control improvements in the Republic of Serbia for the period 2020-2022. year, available at: http://demo.paragraf.rs/demo/combined/Old/t/t2020_08/SG_105_2020_001.htm
9. Epidemiological significances of malignant disease on Kosovo and Metohija, Doctoral Dissertation, Dr Aleksandar V. Antonijevic, available at: https://fedorabg.bg.ac.rs/fedora/get/o:15809/bdef:Content/get
10. Malignant tumours in Republic of Serbia 2021, Institute of Public Health of Serbia "Dr Milan Jovanović Batut", available at: https://www.batut.org.rs/download/publikacije/MaligniTumoriURepubliciSrbiji2021.pdf
11. Epidemiological characteristics and public health significance of malignant diseases, Prof. Dr. Snežana Radovanović, presentation, Academic Doctoral Studies, Faculty of Medical Sciences, Kragujevac, 2023. With permission
12. Screening Serbia, available at: https://www.skriningsrbija.rs/files/Image/2024/EpidemioloskeKarakteristikeMalignihBolestiRS.pdf
13. Dyba T, Randi G, Bray F, Martos C, Giusti F, Nicholson N, Gavin A, Flego M, Neamtiu L, Dimitrova N, Negrão Carvalho R, Ferlay J, Bettio M. The European cancer burden in 2020: Incidence and mortality

estimates for 40 countries and 25 major cancers. Eur J Cancer. 2021 Nov; 157:308-347. doi: 10.1016/j.ejca.2021.07.039. Epub 2021 Sep 21. PMID: 34560371; PMCID: PMC8568058.
14. Center for Cancer Data, official website, available at: https://www.krebsdaten.de/Krebs/EN/Content/Cancer_sites/All_cancers/all_cancers_node.html
15. Lung Cancer in Slovenia, Zwitter, Matjaž et al. Journal of Thoracic Oncology, Volume 14, Issue 8, 1327 – 1331
16. Zadnik V, Primic Zakelj M, Lokar K, Jarm K, Ivanus U, Zagar T. Cancer burden in slovenia with the time trends analysis. Radiol Oncol. 2017 Feb 22;51(1):47-55. doi: 10.1515/raon-2017-0008. PMID: 28265232; PMCID: PMC5330174.
17. WHO, International Agency for Research on Cancer, Global Cancer Observatory, available at: https://gco.iarc.who.int/media/globocan/factsheets/populations/70-bosnia-herzegovina-fact-sheet.pdf
18. Prevention of Malignant Diseases, National Guide of Good Clinical Practice for Physicians in Primary Health Care, Republican Expert Commission for the Development and Implementation of Clinical Practice Guidelines, Serbian Medical Society, Belgrade, 2005.
19. Institute of Public Health of Serbia "Dr Milan Jovanović Batut", available at: https://www.batut.org.rs/index.php?content=2256
20. Santibanez JF, Villar VH, Echeverria C. Current and Future Cancer Chemoprevention Strategies. Pharmaceutics. 2023 May 19;15(5):1543. doi: 10.3390/pharmaceutics15051543. PMID: 37242785; PMCID: PMC10221640.
21. National Cancer Institute, official website, available at: https://www.cancer.gov/research/progress/discovery/strategies-prevention-early-detection
22. Screening programs in Serbia, available at: https://www.skriningsrbija.rs/eng/general-information-about-screening/
23. European Commission, Eurostat, Cancer screening statistics, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Cancer_screening_statistics
24. European Commission, Eurostat, Cancer screening statistics, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Cancer_screening_statistics#Cervical_cancer_screening
25. European Commission, Eurostat, Cancer screening statistics, available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Cancer_screening_statistics#Colorectal_cancer_screening
26. National human development report, Serbia, available at: https://serbia.un.org/sites/default/files/2022-07/Nacionalni-izvestaj-o-ljudskom-razvoju-Srbija-2022.pdf
27. The World Bank, available at: https://data.worldbank.org/indicator/SH.MED.PHYS.ZS?locations=RS
28. Agenda 2030 and Serbia, United Nations, available at: https://rsjp.gov.rs/wp-content/uploads/Agenda-UN-2030.pdf

FIGURES

Fig. 1 Leading localizations of malignant diseases in men, 2021

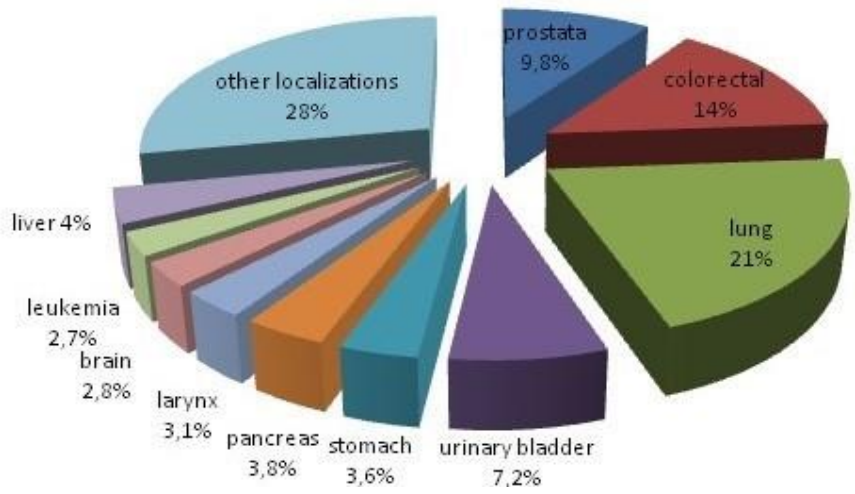

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Fig. 2 Leading localizations of malignant tumors in women, 2021

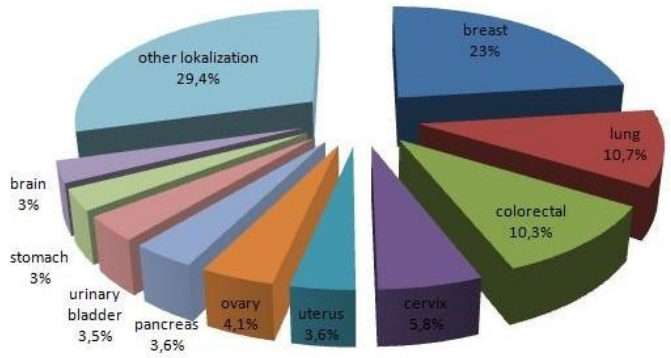

Fig. 3 Mortality rate from malignant neoplasms in Serbia in 2021

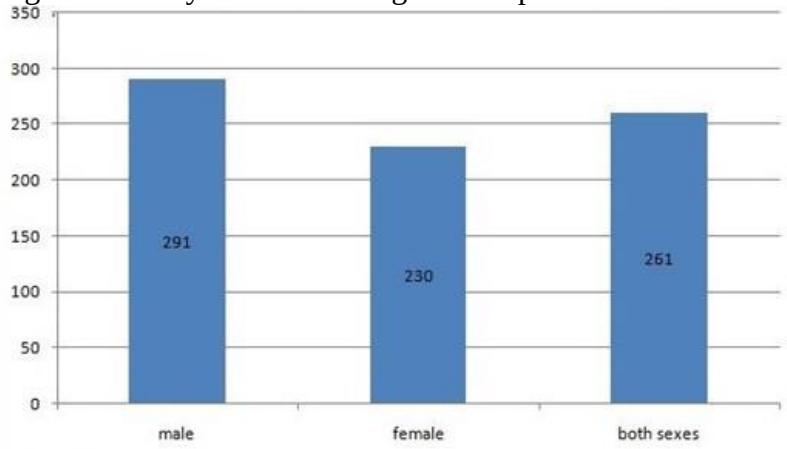

Fig. 4 Leading localizations of malignant tumors in dying men, 2021

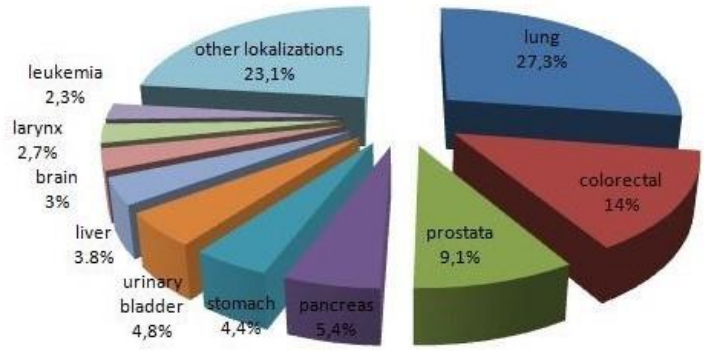

Fig. 5 Leading localizations of malignant tumors in dying women, 2021