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EPIDEMIOLOGICAL PROFILE OF WORK-RELATED CANCER CASES IN BRAZIL FROM 2017 TO 2022

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Abstract: Cancer is the leading or second leading cause of premature death in 73% of countries, affecting individuals aged 30 to 69. In 2016, 29.8% of deaths from non-communicable diseases were caused by cancer. In Brazil, 704 thousand new annual cases of cancer are projected between 2023 and 2025. Occupational exposure is a significant factor, with 19% of cancers related to the work environment. Underreporting and lack of adequate records make it difficult to assess the true extent of occupational cancers in Brazil. The objective of the study was to analyze the epidemiological profile of work-related cancer cases in Brazil between 2017 and 2022. An observational, descriptive and quantitative epidemiological research was carried out, using data from the Notifiable Diseases Information System (SINAN), available on the DATASUS. Data collection covered all registered cases of work-related cancer in Brazil between 2017 and 2022. Variables included age group, race, sex, exposure agents, occupation, ICD and evolution. The data was organized and analyzed in Excel, version 2020, and presented in graphs to facilitate understanding of the results. 2,774 cases of work-related cancer were confirmed in Brazil between 2017 and 2022, with an annual average of 462.33 cases. 2019 had the highest number of cases (791), while 2021 had the lowest (260), possibly due to the COVID-19 pandemic. The majority of cases occurred in men (67.23%) and in the age group of 65 to 79 years (37.49%). White individuals represented 66.33% of cases, with the occupation of agricultural worker being the most affected (17.41%). The most common types of cancer were other malignant neoplasms of the skin (ICD C44) and malignant neoplasms of the bronchi and lungs (ICD C34). Exposure to non-ionizing radiation was the most frequent (19.02%), and 39.17% of case evolution records were ignored. The study revealed an annual average of 462.33 cases of work-related cancer in Brazil, with a predominance of white men, aged 65 to 79 years, and agricultural occupations. The main cause was exposure to non-ionizing radiation, highlighting the need for greater attention and protective measures in the workplace.

Keywords: Cancer; work-related cancer; occupational cancer; malignant skin neoplasm; worker health; occupational medicine; non-ionizing radiation; epidemiology; biostatistics.

INTRODUCTION

In 73% of the world's countries, cancer is the first or second leading cause of premature death among individuals aged 30 to 69. When taking into account only deaths caused by non-communicable diseases, 29.8% of deaths in 2016 were caused by cancer. Cancer incidence projections in Brazil for the period from 2023 to 2025 predict 704 thousand new cases of cancer per year (INCA, 2022).

Despite the fact that cancer is a disease caused by a combination of genetic and epigenetic factors, most types of cancer are caused by a person's lifestyle and interactions with their environment. Therefore, there is currently sufficient scientific evidence to support the association between work and some types of cancer. As a result, the World Health Organization (WHO) estimates that about 19 percent of cancers are caused by the environment, including the workplace. Exposure to half of the chemicals and mixtures classified as carcinogenic to humans is caused by occupational exposure (Weiderpass; Stewart, Bernard, 2020).

In Brazil, work-related cancers have historically been underreported due to a lack of national evidence and insufficient registration, both due to the underreporting of cases and the lack of visibility into the location of cancers recognized by the Brazilian surveillance system. Another factor that also

hinders these notifications is the employee's fear of associating the illness with their work condition (Lima, 2021). Originally, the definition of work-related cancer adopted by the Notifiable Diseases Information System considers confirmed cases as sentinel events, among others, those that result in leukemia due to exposure to benzene; mesothelioma due to asbestos; and hepatic angiosarcoma due to vinyl chloride (Dutra et al., 2023).

Historically, work-related cancers in Brazil have been underreported due to the scarcity of evidence and the low number of records, both due to the underreporting of cases and the lack of visibility into the location of cancers recognized by the Brazilian surveillance system. Employees are also afraid of relating the illness to their work situation, which makes these grades difficult (Lima, 2021).

The Notifiable Diseases Information System initially defined work-related cancers as sentinel events. These events included leukemia caused by benzene exposure, mesothelioma caused by asbestos, and hepatic angiosarcoma caused by vinyl chloride.

However, the Ministry of Health recently established the criterion that all cases of cancer caused by exposure to risk factors, agents and situations present in the environment and work processes, even after interruption of exposure, can be considered work-related cancers (Dutra et al., 2023).

Each year, a large number of new epidemiological studies are carried out to determine whether work exposure increases the risk of developing other types of cancer. By considering work-related problems, the global burden of disease for kidney, breast, nasopharynx, larynx, lung, mesothelioma, ovarian and leukemia cancers was estimated. But prospective cohort studies and meta-analyses show that occupational exposures and cancers in other places, such as the prostate, nasal cavity, esophagus, bladder, liver, and bile ducts (Brey et al., 2020).

By assuming that these interactions can be causal, these cancers can be prevented because workplace exposures can be prevented mainly through the use of personal protective equipment, special training and other workplace safety items and routines (Malucelli; Albuquerque; Moronte, 2020). For more than 50 years, IARC has classified agents, combinations of agents, and circumstances of exposure according to their ability to cause harm to humans. Many of the substances evaluated, which were classified as "definitely", "probably" or "possibly" carcinogenic, have connections to the work (Weiderpass; Stewart, 2020).

Thus, the International Labor Organization (ILO) estimates that occupational exposure is responsible for 17% to 29% of lung cancer cases and 5.3% to 8.4% of all cancer cases. Of all types of cancer, lung cancer represents between 54% and 75% of work-related cancer cases. Exposure to asbestos also contributes to 55 to 85 percent of these cases. In Brazil, recent research on work-related cancer has not been carried out. However, Silva et al. (2020) found that, based only on workers considered definitively vulnerable to work-related cancer, the associable rate would be 2.3% in men and 0.3% in women. Therefore, the objective of the study was to analyze the epidemiological profile of work-related cancer cases in Brazil from 2017 to 2022.

METHODOLOGY

The present study consisted of epidemiological research of an observational, descriptive nature and with a quantitative approach. As it is an epidemiological study carried out with data from the Notifiable Diseases Information System (SINAN), made available in the DATASUS System, it was not carried out Approval from the Ethics and Research Committee (CEP) is required, since

it is a system belonging to the Information Technology Department of the Unified Health System (SUS), as provided by the Ministry of Health, and is in the public domain.

The study covered registered cases of work-related cancer in Brazil from 2017 to 2022. Patient data was collected by measuring SINAN data. Information was collected on cases of work-related cancer in Brazil, from 2017 to 2022. The data was collected in digital format, whose variables of interest for the study included: age group, race, sex, exposure agents, occupation, CID, evolution. The collected data was organized in spreadsheets in Excel software, version 2020, and analyzed using basic statistics and percentages, being presented in graphs for a better understanding of the results.

All cases of work-related cancer in Brazil registered in the SIM during the period from 2017 to 2022 were included in the study, excluding cases outside the time frame or of individuals who did not reside in the state of Brazil. Risks related to conducting the study are associated with difficulties in obtaining accurate and comprehensive data on work-related cancers due to underreporting and lack of adequate recording. Furthermore, there is the possibility of data incompleteness, as there are errors when filling out the notification forms.

The benefits of the study are broad. Through research, it will be possible to identify patterns and trends in work-related cancers in Brazil, helping to optimize more effective prevention and intervention strategies. Furthermore, the study will add more in-depth knowledge about the occupational risks that exist in different sectors and occupations, allowing the restructuring of adequate protection and safety measures and favoring the reformulation of public health policies aimed at reducing exposure to carcinogens in the work environment. work, promoting the health of workers.

RESULTS AND DISCUSSION

The study presented a total of n=2,774 confirmed cases in Brazil, which had an annual average of n= 462.33 cases. Graph 1 shows the confirmed cases of work-related cancer in the state in Brazil that occurred from 2017 to 2022.
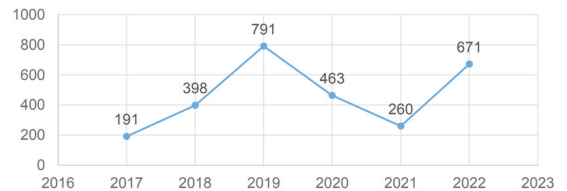
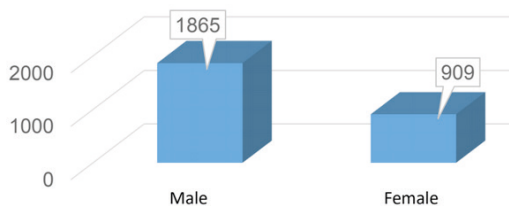

Graph 1: Confirmed cases of work-related cancer, according to the year of occurrence. Brazil. 2017-2022 (n= 2,774).
Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

When analyzing the graph, it is observed that the year with the highest number of cases was 2019 with n= 791 (28.51%) and the lowest number of cases recorded was in 2021 with n= 260 cases (9,37). When looking at the graph, prior to the year 2020, there was a tendency for the number of reported cases to increase, this was due to the population's awareness of occupational risks and diseases acquired according to their work environment, according to Dutra et al., (2023), in Brazil there is a high rate of underreporting of occupational cancer cases, mainly due to the lack of studies on the topic.

Still regarding the graph, it is observed that the 2020-2021 biennium showed a drop in notifications of work-related cancer, since these years, especially 2020, were the height of the COVID-19 pandemic in Brazil and its consequences were extended until 2021, in which the epidemiological scenario changed. Antsy; Brito; Neto (2022), highlighted that compulsory notification pathologies were not registered during the pandemic period, which is justified by the increase in notifications during 2022.

Graph 2 shows confirmed cases of work-related cancer in Brazil, according to gender, from 2017 to 2022.

Graph 2: Confirmed cases of work-related cancer, according to sex. Brazil. 2017-2022 (n= 2,774).
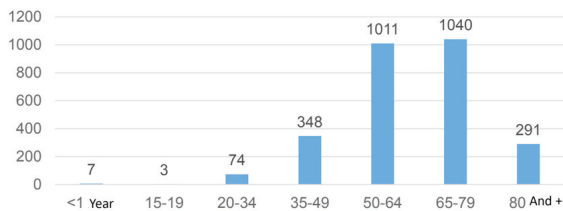
Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

The graph 2 shows that there were n= 1,865 cases (67.23%) in males, while females had n= 909 cases (32.76%), there were no ignored cases.

The data is in agreementIn line with what is observed in the medical literature, Rocha et al., (2022), observed in their study that male individuals presented 71.4% of work-related cancer reports, which is similar to the result observed in the present study.

Contrera; Campos, Carvalho (2020) also observed that85.4% of the cases analyzed belonged to males, since they are more affected by these problems due to the sociocultural characteristics that this category presents, since men are exposed too much to external risks, neglect their health, do not they do not present specific care, they do not even regularly attend health services in a preventive manner, in addition to this, men generally occupy the majority of risky professions, such as agricultural workers and in sectors that handle chemical/radioactive materials.

Graph 3 shows the confirmed cases of work-related cancer in the state of Brazil, according to age group, occurring from 2017 to 2022.

Graph 3: Confirmed cases of work-related cancer, according to age group. Brazil. 2017-2022 (n= 2,774).
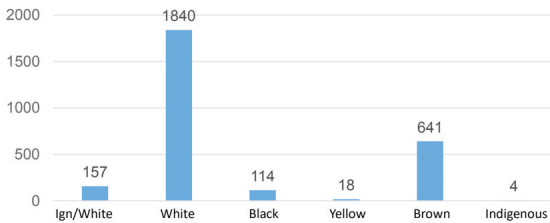
Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

When looking at graph 3, it can be seen that the age group with the highest number of cases was individuals of65 to 79 years of age with n=1,040 cases (37.49%), followed by the age group of 50 to 64 years with n= 1,011 (36.44%), the age group with the lowest number of cases is individuals under one year of age with n=7 (0.25%).

Based on the graph presented, a progression in the number of cases according to age is observed, which is in accordance with the literature. This pattern was also observed in studies by Rocha et al. (2022), where 75.7% of cases involved individuals over 50 years of age. Contrera, Campos and Carvalho (2020) found that 48% of their records were made up of individuals over 70 years old, while those between 40 and 69 years old represented 39% of work-related cancer cases.

This variation occurs due to the fact that cancer is a long-term pathology (in most cases) that appears insidiously due to exposure to risk factors, therefore, in many situations prolonged exposure is the source of the neoplasia, such as in cases of sun exposure or chemical agents (Castro et al., 2022).

Graph 4 shows confirmed cases of work-related cancer in Brazil, according to race, from 2017 to 2022.

Graph 4: Confirmed cases of work-related cancer, according to race. Brazil. 2017-2022 (n= 2,774).

Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

Graph 5: Confirmed cases of work-related cancer, according to occupation. Brazil. 2017-2022 (n= 2,774).
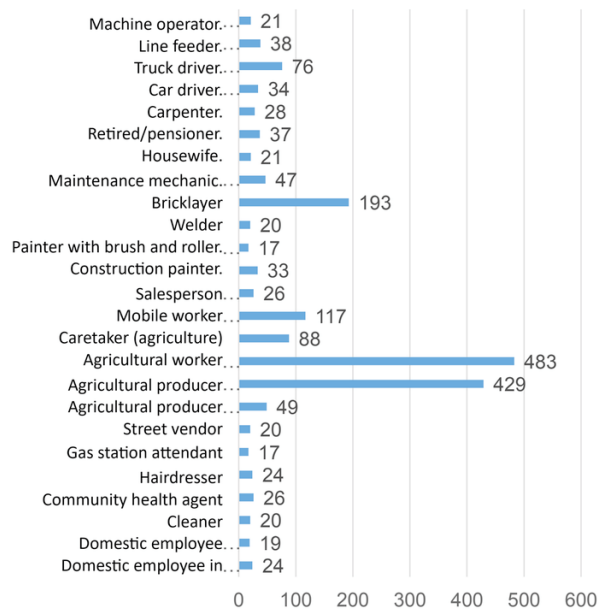
Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

When analyzing graph 4, it is observed that the highest number of work-related cancer occurrences was in individuals declared white with n=1,840 cases (66.33%). The race with the lowest number of registered cases was indigenous individuals with n=4 cases (0.14%).

What was found in the research corroborates Rocha's studies *et al.*, (2022) in which 74.2% of work-related cancer records occurred among white people, as well as Contrera; Campos, Carvalho (2020) who observed that 85% of records also occur in white people and Saldanha et al., (2021) who also observed 85% of records in white individuals.

Furthermore, according to the graph, it appears that only four cases were registered in indigenous individuals, which highlights the underreporting of these cases in this population. Such underreporting, according to Danieli, (2023), can be attributed to the lack of direct access to the health system by many indigenous people, resulting in the non-reporting of this data.

Graph 5 shows the confirmed cases of work-related cancer in Brazil, according to occupation, occurring from 2017 to 2022.

Analysis of graph 5 shows that the largest number of cases was investigated in the "agricultural worker in general" category with n=483 (17.41%), followed by the "multipurpose agricultural producer" category with n=429 (15.46%).

Saldanha et al., (2020) showed that rural producers are those most exposed to the risks not only from solar radiation (which increases skin cancer rates), but also, these workers expose themselves to the risk of contamination by pesticides, which explains why this occupation has high rates of work-related cancer cases.

Table 1 presents the confirmed cases of work-related cancer in Brazil, according to the cancer ICD, occurring from 2017 to 2022.

ICD Cancer	Notifications	%
C16 Malignant neoplasm of the stomach	101	3.6
C34 Malignant neoplasm of the bronchi and lungs	202	7.28
C44 Other malignant skin neoplasms	745	26.85
C50 Malignant neoplasm of the breast	120	4.32
C53 Malignant neoplasm of the cervix	16	0.57
C61 Malignant neoplasm of the prostate	134	4.83
C67 Malignant neoplasm of the bladder	102	3.6
C80 Malignant neoplasm not specified where located	37	1.33
C83 Diffuse non-Hodgkin lymphoma	41	1.47
C85 Non-Hodgkin lymphoma of other types and NE type	32	1.15
C90 Multiple myeloma and plasma cell malignancy	28	1.00
C91 Lymphoid leukemia	31	1.11
C92 Myeloid leukemia	99	3.56
Not filled	413	14.88
Other CIDs not listed	36	1.29
Total	2774	100

Table 1: Confirmed cases of work-related cancer, according to confirmatory criteria. Brazil. 2017-2022 (n= 2,774).

Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

According to table 1, the most observed ICD was C44 Other malignant neoplasms of the skin with n=745 cases (26.85%), followed by ICD C34 Malignant neoplasm of the bronchi and lungs with n=202 (7.28%).

Hair neoplasms are the most frequently observed, mainly due to the pattern of individuals most affected, which are agricultural workers, who have a high degree of continuous sun exposure due to their work condition, therefore, it is expected that these people have a higher degree of exposure., as noted by Saldanha*et al.*, (2020) in their research that showed that 62.4% of respondents declared that they were rural workers and spent most of their time without correct use of Personal Protective Equipment and were exposed to the sun daily for long periods of time, which favors the emergence of skin neoplasms.

Furthermore, these same workers also have direct contact with pesticides and do not use protective equipment when handling these chemicals, therefore, they end up inhaling the vapors arising from these chemicals, pesticides, which explains why the second most prevalent cancer is lung cancer (Sarpa; Friedrich, 2022).

Graph 6 shows the confirmed cases of work-related cancer in the state of Brazil, according to the exposure agent, occurring from 2017 to 2022.
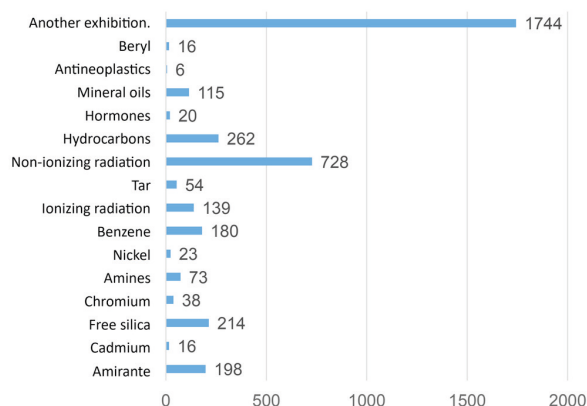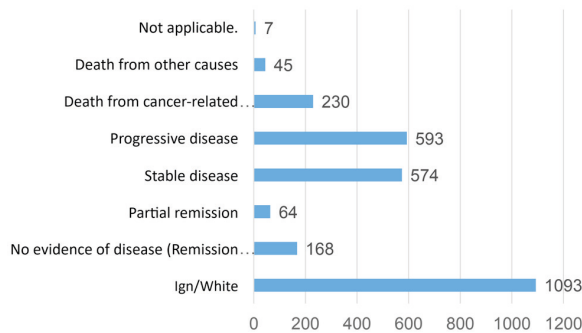

Graph 6: Confirmed cases of work-related cancer, according to exposure agent. Brazil. 2017-2022 (n= 3,826).

Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

According to graph 6, the majority of cases occurred in the "other exposure" category with n=1744 cases (45.58%). However, this data presents uncertainty as it does not qualify the type of exposure, however, the second highest exposure category was non-ionizing radiation with n=728 cases (19.02%). Ionizing radiation is the main cause of occupational cancer in this case, as it is linked to solar radiation.

Analyzing this perspective, there is a lack of specific records about the data, which creates gaps during data measurement, as found by Almeida et al., (2021) in their work on the security of records in surgical centers, which shows that adequate data recording is essential for the exercise of medical practice.

Graph 7 shows the confirmed cases of work-related cancer in Brazil, according to evolution, occurring from 2017 to 2022.

Graph 7: Confirmed cases of work-related cancer, according to evolution. Brazil. 2017-2022 (n= 2,774).

Source: Ministry of Health/SVS - Notifiable Diseases Information System - Sinan Net.

The graph 7 shows that there was no adequate record of the most common type of evolution, since n= 1,093 cases (39.17%) had ignored data, followed by the "progressing disease" category with n=593 cases (21. 37%). The category with the least expressiveness was "not applicable" with n=7 cases (0.25%).

Brazilian literature still presents a lack of data related to occupational cancer, since, despite it being known that many jobs are directly linked to the emergence of these diseases, the notification of these diseases is still incipient, Manoel (2022), in his thesis on doctorate on work-related musculoskeletal disorders, discusses the difficulties encountered not only in the diagnosis, but also in the adequate recording of data related to occupational diseases in general.

However, this reality can also be explained by the lack of counter-referral from hospitals and services linked to the treatment of these neoplasms, caused by work, therefore, there is no way to feed the system back and it ends up collecting gaps relating to the evolution of these patients.

FINAL CONSIDERATIONS

Brazil presented n=2774 work-related cancer cases, of which there was an annual average of 462.33 cases. The year 2019 was the year with the highest number of cases. The epidemiological profile of cases of patients with work-related cancer was men aged 60 to 65 years, white, whose most affected occupational category was "agricultural worker in general". The most common type of cancer found was ICD C44 "Other malignant neoplasms of the skin". Regarding the exposure agent, the "non-ionizing radiation" category was the most observed; there was no adequate record of the most common type of evolution.

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