Epidemiological Nexus of Work-Related Cancer in the City of Londrina-PR

Nexo Epidemiológico do Câncer Relacionado ao Trabalho no Município de Londrina-PR
Nexo Epidemiológico del Cáncer Laboral en la Ciudad de Londrina-PR

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ABSTRACT

Introduction: Work-related cancer has been a condition of compulsory notification since 2004 in the Unified Health System, however, health services have not incorporated this practice into their working routines. **Objective:** To describe the process of establishing the epidemiological nexus of work-related cancer in a reference hospital in the city of Londrina-PR, from the selection of the case to the notification in a national system of notifiable diseases. **Method:** Qualitative, descriptive approach study, whose data was collected through the record of occupational history. The epidemiological nexus was identified when it was possible to meet the criteria of temporality, biological plausibility and bibliographic coherence between occupational activity and the type of cancer diagnosed. **Results:** 579 anamneses were carried out, and of these, in 305 it was possible to establish an epidemiological nexus between cancer and work, after keying in the database of the Notifiable Diseases Information System. **Conclusion:** The study presents a methodology that allows the identification and notification of cases and that can be reproduced in other health services, in order to give visibility to work-related cancer.
Key words: Occupational Health; Occupational Cancer; Health Information Systems; Disease Notification.

RESUMO

Introdução: O câncer relacionado ao trabalho é um agravo de notificação compulsória desde 2004 no Sistema Único de Saúde, no entanto, os serviços de saúde não incorporaram essa prática em suas rotinas de trabalho. **Objetivo**: Descrever o processo de estabelecimento do nexo epidemiológico do câncer relacionado ao trabalho em um hospital de referência no município de Londrina-PR, desde a seleção do caso até a notificação em sistema nacional de agravos de notificação. **Método**: Trata-se de estudo de abordagem qualitativa, descritiva, cuja coleta de dados se deu por meio de registro do histórico ocupacional. Identificou-se o nexo epidemiológico quando foi possível atender aos critérios de temporalidade, plausibilidade biológica e coerência bibliográfica entre a atividade ocupacional e o tipo de câncer diagnosticado. **Resultados**: Foram realizadas 579 anamneses e, destas, em 305, foi possível estabelecer nexo epidemiológico entre o câncer e o trabalho, sucedendo à digitação em banco de dados do Sistema de Informação de Agravos de Notificação. **Conclusão**: O estudo apresenta uma metodologia que possibilita a identificação e a notificação dos casos e que pode ser reproduzida em outros serviços de saúde, a fim de dar visibilidade ao câncer relacionado ao trabalho.
Palavras-chave: Saúde do Trabalhador; Câncer Ocupacional; Sistemas de Informação em Saúde; Notificação de Doenças.

RESUMEN

Introducción: El cáncer relacionado con el trabajo es condición de notificación obligatoria desde 2004, en el Sistema Único de Salud, sin embargo, los servicios de salud no han incorporado esta práctica en sus rutinas laborales. **Objetivo:** Describir el proceso de establecimiento del nexo epidemiológico del cáncer relacionado con el trabajo en un hospital de referencia de la ciudad de Londrina-PR, desde la selección del caso hasta la notificación en el sistema nacional de enfermedades de declaración obligatoria. **Método:** Se trata de un estudio con enfoque cualitativo, descriptivo, cuyos datos fueron recolectados mediante el registro de antecedentes laborales. El vínculo epidemiológico se identificó cuando fue posible cumplir con los criterios de temporalidad, plausibilidad biológica y coherencia bibliográfica entre la actividad ocupacional y el tipo de cáncer diagnosticado. **Resultados:** Se realizaron 579 anamnésicos, de los cuales en 305 se logró establecer un vínculo epidemiológico entre el cáncer y el trabajo, logrando la tipificación en la base de datos del Sistema de Información de Enfermedades Notificables. **Conclusión:** El estudio presenta una metodología que permite la identificación y notificación de casos y que puede ser reproducida en otros servicios de salud, con el fin de dar visibilidad al cáncer relacionado con el trabajo.
Palabras clave: Salud Laboral; Cáncer Profesional; Sistemas de Información en Salud; Notificación de Enfermedades.

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INTRODUCTION

The National Cancer Institute José Alencar Gomes da Silva (INCA)[1] estimated the occurrence of 625 thousand new cases in Brazil for each year of the triennium 2020-2022, being non-melanoma skin cancer the most frequent in the Brazilian population (176,940 thousand new cases) followed by female breast cancer (66,280 thousand), prostate (65,840 thousand), colorectal (41 thousand), lung (30 thousand) and stomach (21 thousand).

It is estimated that 80% of the cancer cases are related to environmental factors more or less avoidable. These factors involve water, land, air, consumer products (food, medication, tobacco, alcohol, and household products), cultural environment (life habits and practices) and occupational environment[2].

The proportion of cancer cases attributed to occupational exposures varies between 4% and 40% depending on the type of tumor and methodology adopted[2]. On its turn, the evaluation of the exposure to carcinogenic agents in work environments is a task requiring specific instruments and methodology applied barely reliable in Brazil.

The Ministry of Health recognizes some types of work-related cancer in Ordinance number 1,339 of 1999[3]. In 2014, the Inter-ministry Ordinance number 9 of 2014[4] concurrently issued by the Ministries of Health, Labor and Social Security acknowledged the "*Lista Nacional de Agentes Cancerígenos para Humanos* (LINACH)" – National List of Carcinogenic Agents for Humans and among them, in the work environment[4].

In 2004, the Ministry of Health issued Ordinance number 777 of April 28, 2004[5] which determined the mandatory notification of work-related harms, among them, cancer. This document was revised, and the last version is Ordinance number 205, February 17, 2016[6].

The card of the "*Sistema Nacional de Agravos de Notificação* (SINAN)" – Notifiable Diseases Information System is the notification instrument. Brazil is the only country in the world to make the notification of health-related harms, mandatory. Nevertheless, until 2018, only 1,644 notifications had been registered in SINAN[7].

In 2012, the Ministry of Health issued the "*Diretrizes para a Vigilância do Câncer Relacionado ao Trabalho*" (DVCRT)[2] – Guidelines for the Surveillance of Work-Related Cancer. It provides technical and epidemiological information to investigate whether the worker during its professional history had contact with potentially carcinogenic compounds present in the working environment[2].

Because cancer is a disease with prolonged latency, it is necessary to have tools to retrieve the work-related experiences of each individual, most of the times in a period far from the diagnosis and thorough retrospective interpretation of this potential exposure[8-10]. Acheson[8] in the 1960's have already pointed out this difficulty.

In Londrina, from January to December 2005, one study identified among the 784 patients consulted at "*Hospital de Câncer*", 296 (37.75%) with diagnosis of cancer listed in the work-related neoplasms (LNRT)[11]. As Londrina has a long experience with this subject, INCA defined it as pilot-municipality to validate the DVCRT. Ever since, the municipality is providing training in partnership with the "*Grupo de Ensino e Pesquisa em Epidemiologia do Câncer*" (Gepec) – Group of Teaching and Research in Epidemiology of Cancer of the "*Universidade do Estado do Rio de Janeiro*" (Uerj) in several states and improving the process of notification.

Despite the mandatory nature of notification of work-related cancer since 2004 in SUS – National Health System, only in 2012 SUS could count with the DVCRT.

However, health services did not incorporate this practice in their working routines, which justified the elaboration of this study that did not attempt to identify those who were submitted to occupational exposure among the total of cases of a certain type of cancer in the general population; instead, it was tried to establish the praxis for the definition of the epidemiological nexus and further notification.

Based in this scenario, the following question is made: *How the "Núcleo de Atenção à Saúde do Trabalhador (NAST)" – Nucleus of Attention to the Health of the Worker of the municipality of Londrina-PR grants epidemiological nexus to work-related cancer in order to ensure visibility to the cases through notification in SINAN?*

The objective is to describe the process of establishment of the epidemiological nexus of the work-related cases of cancer in a reference hospital in the municipality of Londrina-PR.

METHOD

Qualitative, descriptive study presenting the process of establishment of the epidemiological nexus of the work-related cancer cases in a reference hospital of the municipality of Londrina-PR. The article is part of the doctorate dissertation titled "Implementation of work-related cancer monitoring in Londrina from 2011 to 2014" whose method was action-research[12].

The scenario was a hospital classified as High Complexity Oncology Reference Center (Cacon) to consult approximately 90.0% of the cases of cancer of the municipality and Metropolitan Region.

Two skilled occupational exposure technicians of the worker health service of the municipality of Londrina conducted the selection, analysis, and assessment of the cases.

The selection process occurred *in loco* using intentional sample, where the investigators select the participants with the purpose of meeting the object of the study.

Data were collected from April 2013 and March 2020, 579 patients with confirmed diagnosis by an assistant-physician and registered in DVCRT, admitted in the units of clinical or surgical treatment, conscious and able to communicate themselves or with a relative capable of providing the required information for the occupational anamnesis, were enrolled.

The information collected from electronic charts were name of the patient, bed, number of the chart, type, and date of the diagnosis of the primary tumor and card of anamnesis proposed in DVCRT, with fields to register the occupational history. The cards were tested in hospitalized patients of another hospital of the municipality and adapted by the technicians to optimize the process.

The card contains the identification of the patient and field to register the occupational history both in the front and back. At the back of the card, fields to systematize the information were included to favor the identification of the occupation, the agent and time of exposure of each activity described.

The anamnesis for every eligible patient lasted 20 minutes in average and the DVCRT[2] was adopted as theoretical reference further to technical information about each work process[13].

The participants signed the Informed Consent Form (ICF) after clarifications about the study. The Institutional Review Board of "*Universidade Norte do Paraná*" approved the study, number CAAE: 07593612.8.0000.0108. Ordinance 466/12 of the National Health Council was complied with[14].

The study met the Consolidated criteria for reporting qualitative research – Coreq[15], a 32-items guide for the development of qualitative studies

RESULTS AND DISCUSSION

579 anamneses were performed. In 305 of them, it was possible to establish the epidemiological nexus between cancer and work. To describe the process, the results will be presented in four stages: selection of the participants, description of the occupational anamnesis, analysis, and establishment of the epidemiological nexus, which is the core object of the study and notifications in the database of SINAN (Figure 1).
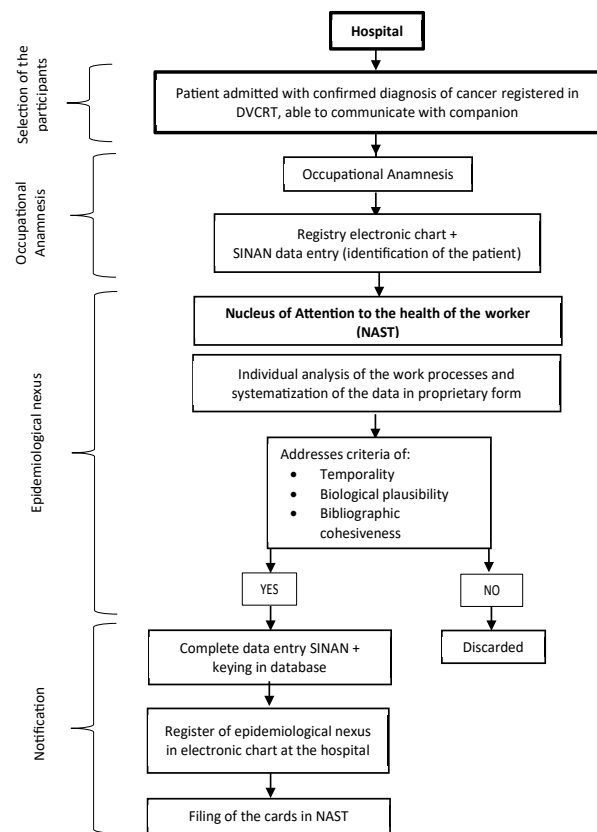

Figure 1. Flowchart of the phases for the establishment of the epidemiological nexus of the work-related cancer and notification in SINAN

SELECTION OF THE PARTICIPANTS

The selection of many types of cancer found in DVCRT was conducted based in the prioritization addressed during the training course ministered by the municipality in 2011. Some types of cancer were agreed upon considering the production profile of the municipality, in the specific literature and easiness of access to hospitalized patients in cancer reference hospitals[16].

The cases of head and neck and bladder cancers were the first. From November 2013, the searches were extended for patients with other types of cancer listed in DVCRT[2].

Initially, a list of the patients in clinical and surgical admission was obtained through electronic charts in order to identify the cases with confirmed diagnosis of cancers whose primary tumor was included in DVCRT[2]. The diagnosis is described in the tests results and medical evolution.

Next, the name of the patient, bed, type, and date of the diagnosis of the primary tumor were transcribed in the occupational anamnesis.

OCCUPATIONAL ANAMNESIS

Patients were interviewed individually, starting with the oldest occupation (the first when the individual started to work considering the age, local and function). All the activities reported by the patient in each workplace were described, with employment relationship or not. They were asked about the agents/substances possibly utilized in each activity described. The importance of this direct contact to detail the occupational history was noticed in a French study[9].

The occupational anamnesis is one of the main instruments to investigate the relations health-work-disease for a correct diagnosis of the harm and its etiology associated with the work[8,13]. Historically, although occupational anamnesis is associated with the physician[13], in Londrina-PR it was observed that the responsibility for its completion should not be limited to this professional alone since it is not a diagnosis. Every health professional dully skilled and involved with the subject is able to conduct the occupational investigation[17].

Next, the register of the evolution of the patient was made, indicating the occupational anamnesis was concluded as well as the initial completion of the patient's identification in SINAN card.

The identification contains the field "occupation" filled by the professional at the registry at the admission, however, for the establishment of the epidemiological nexus, the occupation to be considered is the one which matches the exposure to possible carcinogenic agents. In this study, of the 305 epidemiological nexus granted, in 122 (40.0%), the occupation indicated in the Cancer Hospital Registry (CHR) and the compatible occupations did not match the nexus.

The period between the exposure and the disease can extend for decades, the information collected in the occupational anamnesis exceed the completion of the field "occupation" in the CHR. Since the decade of 1960, Acheson[8] already indicated that the current occupation has limited value considering the changes occurring during the life of the worker, a fact observed in Londrina too.

Therefore, this study has shown that it is not possible to establish the epidemiological nexus for notification at SINAN only comparing the current occupation reported by the patient with LNRT. In many cases, for instance, the patient can claim it is a "janitor", when it was a farmer during most part of its working life, actually.

ESTABLISHMENT OF THE EPIDEMIOLOGICAL NEXUS

With the occupational information and the diagnosis of the primary cancer, it was attempted to detail each work process described by the patient during its working activities in order to identify a possible exposure to carcinogenic agents. Next, all the activities reported were systematized so, eventually, it was possible to identify the occupation, the agent and time of exposure, allowing to conclude whether the findings supported or not the relation of the occupation with the agent/exposure and the cancer in question.

According to the literature, the relation between the exposure and the type of cancer capable of figuring out the epidemiological nexus should be based in arguments that uphold its presumption[13,18]. Therefore, the technical conviction should be complete because little is known about the possibilities of crossed exposures working as causal agent or contributor factor for several types of cancer.

In addition, further to the diagnostic reasoning of multicausal harms, where the existing knowledge do not allow neither the full proof nor the absence of the relation with work, the conclusion must be based in the comparison with the current findings pro and against the nexus.

In the most simple situations pro nexus, the identified indications are: a) risk exposure for the harm; b) good health conditions in the beginning of the exposure; c) evolution with onset of the harm in conformity with the time of latency already described in the literature and other favorable findings for the recognition of the secondary nature of the harm as, for instance, affecting the worker younger than the age when the harm with idiopathic nature usually onsets; d) disregarding non-occupational causes of the same harm.

For the possible association between exposure and disease, the fundamental aspects considered were temporality, biological plausibility and bibliographic cohesiveness[2].

Some authors report that one of the difficulties encountered for the establishment of the nexus is related to the temporality, given the variability of the latency periods reported for the development of cancer[8,9,18-21]. Latency is understood as the time of exposure to a certain agent and the presumed onset of the disease[2].

For the current study, the reference to determine the minimum latency period between the first exposure to the allegedly carcinogenic agent and the diagnosis of the disease was 20 years for solid tumors and five years for hematologic tumors pursuant to DVCRT[2].

Concerning the biologic plausibility, the agents/substances reported in the occupational anamnesis and their respective evidence of carcinogenicity for humans established by DVCRT[2] were considered. The importance of observing the routes of exposure, the equipment that possibly impede the human contact and/or the confinement of the work process should be taken into consideration.

In relation to bibliographic cohesiveness, in addition to DVCRT, other applicable bibliographies were utilized to support the analysis of the work processes as, for instance, books of organic chemistry, cytology, oncology, sites related to composition/use of paints pesticides, solvents, fuels, dusts, radiations among others. The exposure in the work environment is as rich as unique as it can be, so, these criteria cannot be definitive to rule out the presumption of nexus. In many cases, some substances are used in maintenance and the recognition of risk in the work process is underestimated.

Based in the three criteria, the epidemiological nexus was established for 305 patients (52.7%) of the 579 anamneses performed. The distribution of the total anamnesis and nexus per type of tumor in presented in Graph 1.
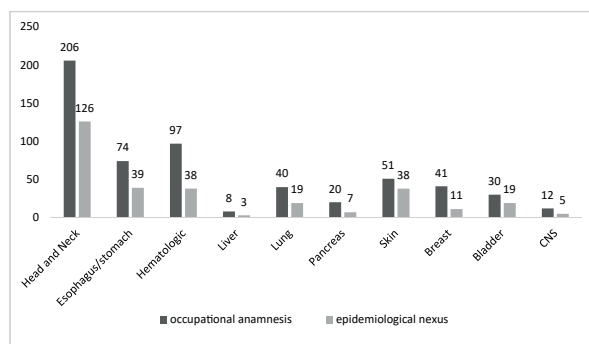
Graph 1. Distribution of occupational anamnesis and epidemiological nexus established according to the local of the primary tumor. Londrina, April 2013 to March 2020

A study of Doll and Peto[22] reports that 4% of the cases of cancer is attributed to occupational exposure and Leigh[23], between 8% and 16% the proportion of cases related to occupational exposure. No similar results in the literature for the hospitalized patient exist.

However, unlike what these authors present, this study did not attempt to identify those who were not submitted to occupational exposure. The goal was to establish the praxis for the establishment of the epidemiological nexus and further notification in a health service.

The process to identify the relation between exposure and type of cancer is not well systematized in the procedures of SUS and the initiative to systematize was made in the protocols published by the Ministry of Health and by Ribeiro[24]. In this case, the operationalization through Cacon to identify the cases and the establishment of the nexus by a professional of the worker health area shows the importance and possibility of integration intra-SUS, which is well advocated but tough to be completed.

NOTIFICATION IN SINAN

This last stage consisted in transcribing the information supporting the epidemiological nexus into SINAN card and entry in the national database.

SINAN should be filled by the reporting source and sent to typing either in the epidemiological surveillance service of the municipality or in any other site where it is possible to type. In Londrina, the investigators who work in NAST too are in charge of the typing.

After the notification, the investigators return to the hospital to enter the data about the nexus established in the electronic chart. Therefore, the hospital team can visualize the information and eventually, the card is filed in NAST.

In Brazil, the notification of work-related cancer is mandatory since 2004 according to Ordinance number 777[5]. The increase of notification in the country became relevant since 2011. Between 2011 and 2018, 1,571 cases of work-related cancer in Brazil were registered, 596 (43.4%) in Paraná[7]. In 2013, Londrina initiated the active search to feed the notification of cases in SINAN and ever since, 305 cases were registered in Londrina.

The utilization of SINAN together with the other Health Information Systems is an important tool to facilitate the formulation and evaluation of policies, plans and health programs, supporting the process of decision taking in order to contribute for the improvement of the health condition of the population[25].

France, Italy, Czech Republic, Slovakia, Poland, and Canada have occupational cancer registries for purposes of social security, indemnifications, and preventive actions[9,19,20,26]. As Brazil is the only country to notify work-related cancer based in a national health services database, it was not possible to compare with similar studies.

The relevance of these notifications lies also in the possibility of identifying cases in the unregistered population, in temporary jobs and in other unregulated forms of occupation that are invisible for the social security system but represent more than 60% of the Brazilian professional occupation.

The difficulties of enrolling all the patients with diagnosis of cancer admitted at the hospital in that period, the complexity of identifying the past exposures and lack of a policy that promotes the integration among the several areas of SUS are the limitations of this article.

CONCLUSION

The required stages for the establishment of the epidemiological nexus have been presented directly and show its feasibility since the access to the charts and the occupational anamnesis until the notification of the work-

related cancer in SINAN. The feasibility is important when the discussions are still incipient.

These results meet the scientific demand for technical support to the practice of the health services. The unprecedented experience is strongly related to personal initiatives of local policy and ends by demonstrating the possibilities of articulation among different health areas, attention to cancer and health of the worker without additional cost impacting the notifications to SUS and possible to be replicated in other similar scenarios.

CONTRIBUTIONS

Renata Cristina Silva Baldo contributed for the study design, collection, analysis and interpretation of the data, elaboration of the manuscript and critical review. Claudete Stábile Ribeiro Romaniszen contributed for the collection, analysis and interpretation of the data, elaboration of the manuscript and critical review. Regina Stella Spagnuolo contributed for the elaboration of the manuscript and critical review. Fátima Sueli Neto Ribeiro and Ildeberto Muniz de Almeida contributed for the critical review. All the authors approved the final version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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