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Noise-induced hearing loss in Brazil: a description of 14 years of notifications

Perda auditiva induzida por ruído no Brasil: descrição de 14 anos de notificação

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ABSTRACT

Purpose: To describe the notifications of NIHL in Brazil, according to sociodemographic and labor aspects, in the period from 2006 to 2019. **Methods:** Cross-sectional and descriptive study carried out with data from notification forms for noise-induced hearing loss in Brazil, from SINAN. The data were accessed through the page of the Collaborating Center for Surveillance of Workers' Health Disorders (ISC-UFBA). Absolute and relative frequencies of sociodemographic variables and work characteristics were analyzed. **Results:** During the period, 7,819 cases of NIHL were reported in Brazil. The year 2016 and the state of São Paulo registered the highest number of notifications, with 1,106 and 2,488 cases, respectively. Throughout the period, there was a higher proportion of cases in: individuals with a formal contract (55.0%), male (88.2%), white (59.1%) and aged between 50 and 59 years (33.7%). Continuous noise was predominant in the work environment (41.1%) and 51.1% of the individuals used individual protection measures, while 12.6% were protected collectively. **Conclusion:** A total of 7,819 cases of NIHL were reported in Brazil in the period analyzed, a number that can be considered disproportionate in relation to the prevalence of this condition. The observed underreporting impacts on the understanding of the magnitude of the problem, and, consequently, on the development and implementation of public health actions and programs, aimed at worker health and safety.

Keywords: Notification of work accidents; Disease notification; Noise; Hearing loss caused by noise; Health information systems

RESUMO

Objetivo: descrever as notificações de perda auditiva induzida por ruído (PAIR) no Brasil, segundo aspectos sociodemográficos e laborais, no período de 2006 a 2019. **Métodos:** estudo transversal e descritivo, realizado com dados das fichas de notificação de PAIR no Brasil, oriundos do Sistema de Informações de Agravos de Notificação. Os dados foram acessados por meio da página do Centro Colaborador de Vigilância aos Agravos à Saúde do Trabalhador. Foram analisadas as frequências absolutas e relativas de variáveis sociodemográficas e de características do trabalho. **Resultados:** no período, foram notificados 7.819 casos de PAIR no Brasil. O ano de 2016 e o estado de São Paulo registraram o maior número de notificações, com 1.106 e 2.488 casos, respectivamente. Em todo o período, houve maior proporção de casos em indivíduos com carteira assinada (55,0%), gênero masculino (88,2%), cor de pele branca (59,1%) e faixa etária de 50 a 59 (33,7%). O ruído contínuo foi predominante no ambiente de trabalho (41,1%) e 51,1% dos indivíduos faziam uso de medidas de proteção individual, enquanto para 12,6% a proteção foi coletiva. **Conclusão:** foram notificados 7.819 casos de PAIR no Brasil no período analisado, número que pode ser considerado desproporcional, em relação à prevalência desse agravo. A subnotificação observada impacta a compreensão da magnitude do problema e, consequentemente, o desenvolvimento e implementação de ações e programas de saúde pública, voltados para a saúde e segurança do trabalhador.

Palavras-chave: Notificação de acidentes de trabalho; Notificação de doenças; Ruído; Perda auditiva provocada por ruído; Sistemas de informação em saúde

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INTRODUCTION

Noise is the second most common risk factor in work environments[1] and, depending on sound pressure levels, exposure time, and its presentation pattern (continuous, intermittent, impulsive)[2,3], it is capable of causing noise-induced hearing loss (NIHL)[4-6]. The World Health Organization (WHO)[6] points out that, worldwide, 4 million Disability Adjusted Life Years (DALYs) are lost as a result of occupational noise exposure, with percentages varying from 7% to 21% in different regions. A 2016 study found that, per year, 2.5 healthy years were lost due to NIHL, for every 1,000 noise-exposed workers in the USA[7].

NIHL is recognized as a work-related health hazard, of compulsory notification[8] in the Sistema de Informação de Agravos de Notificação (Brazilian Notifiable Diseases Information System) (SINAN), whose monitoring is done by the Vigilância em Saúde do Trabalhador (Worker's Health Surveillance) (VISAT)[9], a member of the Rede Nacional de Atenção Integral à Saúde do Trabalhador (Brazilian National Workers' Health Network) (RENAST). The RENAST aims to disseminate worker's health actions, articulated with the other networks of the Sistema Único de Saúde (Brazilian Unified Health System) (SUS) and, from the Centros de Referência em Saúde do Trabalhador (Worker's Health Reference Centers) (CEREST), to ensure the notification of work-related health problems on SINAN[10].

Recent research that used SINAN's NIHL notification database points to an increasing trend in the number of NIHL notifications in Brazil in recent years[9,11] despite the fact that, between 2013 and 2015, only 5% of Brazilian municipalities had notified NIHL[9]. This data promotes a reflection about a possible underreporting of this grievance, which interferes both in the visibility of the disease and in the planning and execution of interventions to improve the work and the worker's health[11,12]. NIHL, by itself, is not indicative of inability to work, as provided by the Ministerial Ordinance No. 6734 of March 9, 2020[13], a fact that may justify the scenario of underreporting of this grievance in the country.

Therefore, the need to establish an intrinsic relationship between awareness of the grievance and its notification is justified, aiming at the effective development of promotion, prevention, assistance, and surveillance actions in Worker's Health[12]. In this context, the goal of this study was to describe NIHL notifications in Brazil, according to sociodemographic and labor aspects, from 2006 to 2019.

METHODS

Study design and data source

This is a cross-sectional and descriptive study, carried out with data from NIHL notification forms in Brazil, between the years 2006 and 2019, from SINAN.

The NIHL data were made available by the Coordenação Geral de Saúde do Trabalhador do Ministério da Saúde (General Coordination of Occupational Health of the Ministry of Health) (CGSAT/MS) to the Centro Colaborador de Vigilância aos Agravos à Saúde do Trabalhador do Programa Integrado em Saúde Ambiental e do Trabalhador (Collaborating Center for Surveillance of Worker's Health Diseases of the Integrated Program for Environmental and Worker's Health) (CCVISAT), Institute of Collective Health, Federal University of Bahia[14]. The CCVISAT makes the databases available on its website for analysis and promotion of scientific and technological knowledge on worker's health, especially in the field of epidemiology, in order to contribute to the training of teachers and researchers.

Variables

The variables were divided into two different blocks. The first one is called "sociodemographic characteristics", and included: year of notification (2006 to 2019); federative unit of notification (26 states and the Federal District); age group (17 to 29, 30 to 39, 40 to 49, 50 to 59, 60 or over); gender (male, female) and skin color (white, black, yellow, brown, indigenous). The second block, "occupational characteristics", covered: labor market status (registered employee, unregistered employee, self-employed, public servant, retired, unemployed, other); type of predominant noise (continuous, intermittent, both); time off work for treatment (yes, no); use of individual protection (yes, no); use of collective protection (yes, no), and issuance of the Work Accident Communication (CAT) (yes, no, not applicable).

Data analysis

The data were tabulated in Microsoft® Excel spreadsheets and later exported to the software Stata 14 . The absolute and relative frequencies and 95% confidence intervals (95%CI) were analyzed. The ignored categories were not considered for the description of the analyses. The authors accessed the data in May 2021.

Ethical aspects

Since this is public domain data and without the identification of the participants, approval by the Committee for Ethics in Research on Human Beings of the Federal University of Santa Catarina, where the work was carried out and, consequently, the Termo de Consentimento Livre e Esclarecido (Free and Informed Consent Term) (TCLE) was waived, according to resolution No. 510, April 7, 2016 of the Brazilian National Health Council.

RESULTS

Between the years 2006 and 2019, 7819 cases of NIHL were reported in Brazil. The state of São Paulo registered 31.9% of all notifications in the country (n=2488), followed by Mato Grosso do Sul (13.5%) and Minas Gerais (12.0%). The states of Pará and Piauí have no record of notifications for NIHL in the analyzed period (Figure 1).

Figure 2 shows the number of NIHL notifications between 2006 and 2019. The year 2016 recorded the highest number of notifications in Brazil, with 1106 cases, while the first year of the considered period recorded only 22 cases. Until 2011,

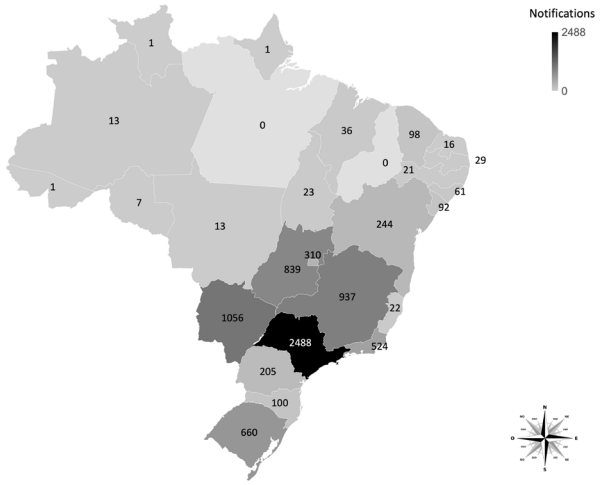

Figure 1. Absolute number of notifications of noise-induced hearing loss, according to the Brazilian states. Brazil, from 2006 to 2019

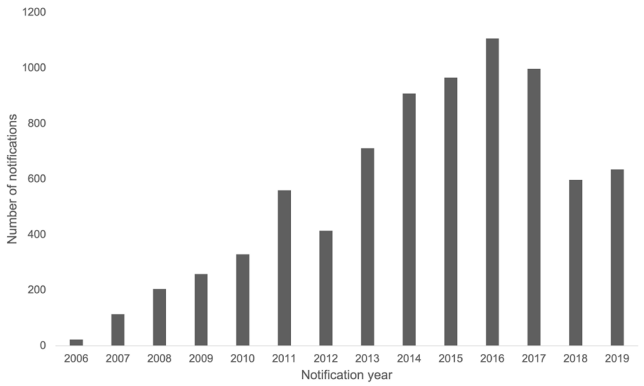

Figure 2. Distribution of the number of notifications of noise-induced hearing loss in Brazil according to year of notification. Brazil, from 2006 to 2019

there was a gradual increase in the number of notifications, with a drop in 2012, and a subsequent increase until the year 2016 (Figure 2).

Regarding the notifications, a higher prevalence was observed for the male gender (88.2%) and for individuals with white skin color (59.1%). There was a higher proportion of notifications for the age group of 50 to 59 (33.7%), followed by individuals aged 40 to 49 years (26.7%) (Table 1).

Regarding the labor characteristics of the individuals, most of the notifications occurred for registered employees (55.0%), followed by the self-employed (13.5%), and retired (11.0%). The predominant type of noise in the work environment was continuous (41.1%) and 51.1% of the workers received individual protection measures, while only 12.6% received collective protection, and 7.4% were given time off work for treatment. The issuance of a Work Accident Communication (CAT) occurred in only 26.6% of the cases (Table 2).

Until the year 2010, the number of issued CATs was higher compared to the number of non-issues. However, since then, there has been a reversal of this pattern, with the absolute numbers of CAT non-issues exceeding the number of issues for the entire period. As for the conduct established after evidencing the grievance, there were lower proportions of adoption of collective protection over the years. On the adoption of individual protection, as of 2016, there was higher adherence compared to non-adherence (Figure 3).

Table 1. Description of the sociodemographic characteristics of NIHL notifications. Brazil, from 2006 to 2019

Variables	n	%	95%CI
Gender (n=7819)			
Male	6895	88.2	87.4 - 88.8
Female	924	11.8	11.1 - 12.5
Age group (n=7783)			
17 to 29	351	4.5	4.0 - 4.9
30 to 39	1051	13.5	12.7 - 14.3
40 to 49	2082	26.7	25.7- 27.7
50 to 59	2621	33.7	32.6 - 34.7
60 or over	1678	21.6	20.6 - 22.5
Skin color (n=5698)			
White	3367	59.1	57.8 - 60.6
Black	391	6.9	6.2 - 7.5
Yellow	155	2.7	2.3 - 3.1
Brown	1763	30.9	29.7 - 32.1
Indigenous	22	0.4	0.2 - 0.5

Source: Brazilian Notifiable Diseases Information System (SINAN)
Subtitle: n = number of notifications; 95%CI = 95% Confidence Interval

Table 2. Description of occupational characteristics of noise-induced hearing loss notifications. Brazil, from 2006 to 2019

Variables	n	%	95%CI
Employment status (n=7287)			
Registered employee	4012	55.0	53.9 - 56.1
Unregistered employee	86	1.2	0.9- 1.4
Self-employed	981	13.5	12.6 - 14.2
Public servant	508	7.0	6.4 - 7.5
Retired	803	11.0	10.3 - 11.7
Unemployed	635	8.7	8.0 - 9.3
Other	262	3.6	3.1 - 4.0
Prevalent type of noise (n=6767)			
Continuous	2781	41.1	39.9 - 42.2
Intermittent	1650	24.4	23.3 - 25.4
Both	2336	34.5	3.3 - 35.6
Time off work for treatment (n=5442)			
Yes	405	7.4	6.7 - 8.1
No	5037	92.6	91.8 - 93.2
Use of individual protection (n=6075)			
Yes	3107	51.1	49.8 - 52.4
No	2968	48.9	47.5 - 50.1
Use of collective protection (n=5729)			
Yes	725	12.6	11.8 - 13.5
No	5004	87.4	86.4 - 88.1
CAT issuance (n=5375)			
Yes	1430	26.6	25.4 - 27.8
No	3259	60.6	59.3 - 61.9
Not applicable	686	12.8	11.8 - 13.6

Source: Brazilian Notifiable Diseases Information System (SINAN)
Subtitle: n = number of notifications; 95%CI = 95% Confidence Interval

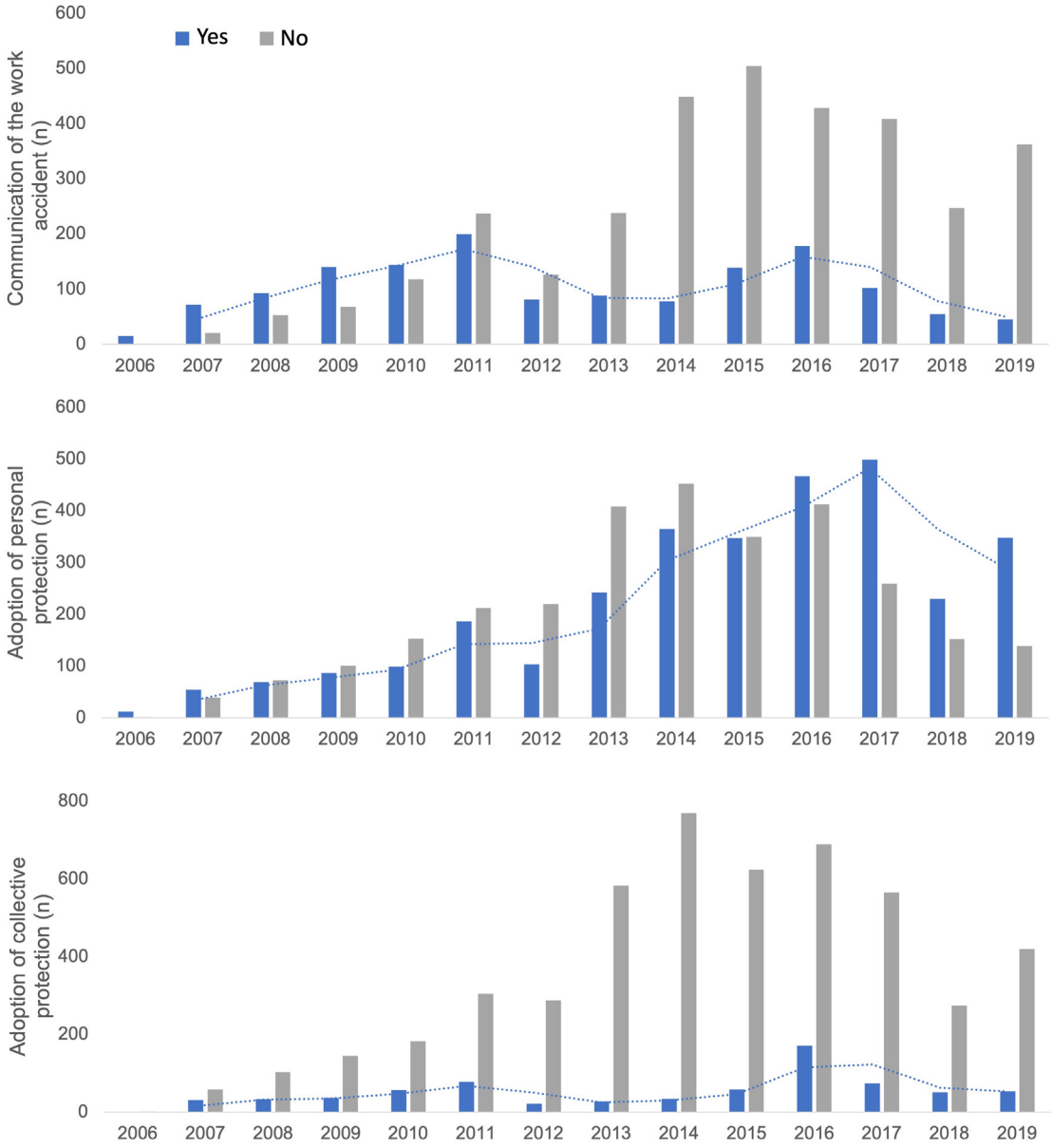

Figure 3. Distribution of the number of notifications of noise-induced hearing loss, per year, according to CAT issues, use of individual protection and collective protection. Brazil, from 2006 to 2019

DISCUSSION

This study verified the occurrence of 7819 notifications of NIHL in the analyzed period. The states of São Paulo and Mato Grosso do Sul presented the highest number of notifications, respectively. A higher prevalence of notifications was observed for males, with white skin color, 50 to 59 years old. The notifications had the highest occurrence for registered employees, followed by the self-employed. Continuous noise was prevalent in the work environment, with higher prevalence of workers using individual protection and lower prevalence of adherence to collective protection. 7.4% of the subjects took time off work for treatment, and the CAT was issued in only 26.6% of the cases.

The Southeast (São Paulo, Minas Gerais) and Midwest (Mato Grosso do Sul) regions of Brazil recorded the highest number of NIHL notifications. This fact may be related to aspects such as the economic and industrial representativeness of the Southeast Region, as the states of São Paulo and Minas Gerais occupied, in 2017[15], the first and third place in the national ranking of the social security contribution collection in the industrial sector, amounting to R$37,544,000.00. Associated with this is the numerical representativeness of industrial establishments in these two states, which, in 2020[16], ranked first and second nationally, with 120901 and 59876 establishments, respectively. Moreover, the Southeast region has a historical role in the structuring of programs and actions related to worker's health and concentration of scientific production in the area[9], besides the historical context of CEREST's qualification. In this context,

São Paulo is the first state to promote the regional structuring of CEREST, as well as Minas Gerais, which had its first centers implanted in 2002[9].

In this study, we observed a higher proportion of NIHL notifications for the 50 to 59 age group, followed by the 40 to 49 age group. We highlight the association between cases that suggest NIHL and age, since the prevalence increases as the age group increases[17]. A study[18] estimated this increase to be approximately 11 times greater in workers over the age of 50 than in workers under the age of 30.

The highest occurrence of NIHL notification was found for Caucasians, in line with a previous study[19], and for males, a finding that also validates studies[19,20] that found a higher prevalence of occupational noise exposure for this gender. Some aspects can be considered in order to justify this finding, such as the heterogeneous distribution of genders among the production sectors**,** with men more often employed in civil construction, in the processing industry, and in the extractive sector, historically noisy environments[21].

This study found that the absolute numbers of CAT non-issuance exceeded the numbers of issuance as of 2011, with CAT being issued in only 26.6% of the cases. A study carried out in 2009[22] showed a decrease, over the years, of CAT issuance, from 33 in 2004 to 19 in 2006. Employers' refusal to notify the accidents through the CAT is common, as well as the difficulty of access to the industries' files by the professionals of surveillance in worker's health, preventing the knowledge of the real situation in the country.

As established in the legislation, the CAT must be issued[23] in cases of work-related accidents, such as work-related and occupational diseases, regardless of whether or not there is a leave of absence from work activities. Thus, the issuing of a CAT officially registers and recognizes the accident, establishing the worker's right to accident insurance with the Instituto Nacional de Seguridade Social (National Institute of Social Security) (INSS)[24], as well as allowing the compilation of data on work accidents and the elaboration of official statistics on the subject[25].

Another point to be highlighted, besides the issuing of the CAT, is the notification of NIHL on SINAN, a system fed from the notification and investigation of cases of diseases and grievances that are on the national list of compulsory notification diseases, that must occur in case of confirmation or suspicion of injury to the worker generated by a workplace accident. The SINAN is considered an important tool to assist health planning, define intervention priorities, and evaluate the impact of interventions. Moreover, notification is an essential factor in the (re)organization of the work practices of CEREST, which must be guaranteed by the health services network, from an integrated process of monitoring and evaluation, allowing the process of management of the health condition at work to be adjusted[26].

In Brazil, the notification of NIHL cases is compulsory and is done through SINAN. The inclusion of NIHL as a compulsory notification grievance dates back to 2004; however, the number of reported cases is still small, considering the prevalence of this grievance[9,21]. Although Brazil has advanced health information systems, such as the Sistema de Informação sobre Mortalidade (Mortality Information System) (SIM), the Sistema de Informações sobre Nascidos Vivos (Live Birth Information System) (SINASC), and SINAN, these systems lack a broad and adequate record of notifications by professionals[11]. The underreporting of SINAN[25] is associated with data from Social Security[27,28], which includes information about the economically active population. Moreover, in this research, there was a higher prevalence of notifications among registered workers and only 1.2% among unregistered workers. This finding may be linked to the fact that the population informally inserted in the labor market is not contemplated by labor laws, sectoral programs, union actions, and inspections, which results in the underreporting of the grievance[21].

Furthermore, it is necessary to pay attention to factors such as the performance of the sentinel units; training and capacity building on work accidents; knowledge about ordinances and laws that support the notification; understanding of compulsory notification; discussions on the subject in the daily work, in order to increase the notifications of NIHL, subsidize actions that favor its notification, thus contributing to the surveillance of this grievance in Brazil[27]. Regarding the sentinel units, their role is to ensure the quality of information, since it is responsible for the identification, investigation, and notification of work-related diseases and accidents, acting as technical support for the healthcare network[28].

With regard to the conduct adopted after the grievance was found, we verified a lower proportion of use of collective protection over the years. Collective protection measures against noise exposure, whether replacing machinery, changing work processes, or blocking the source of noise, are considered very effective in controlling noise, but are difficult when considering the cost and technological implementation[29]. Thus, individual protection measures have achieved a status of protagonism in the occupational environment, given their feasibility, lower cost, relative effectiveness, and easy access[29].

Also with regard to the adoption of individual protection measures, there was a greater adherence to them as of 2016. According to the authors[30] who conducted a survey of studies that related variables associated with occupational noise exposure with the use of hearing protection equipment, workers' perception of the risk of noise exposure is an important predictor of the decision to use hearing protection equipment.

As a limitation of the study, we consider the fact that secondary databases are directly influenced by the quality of filled out information and the heterogeneous characteristics of the Brazilian regions, thus reinforcing the need for its improvement and strengthening, in order to achieve excellence in the management of SINAN information. A scenario like that in Brazil, with incipient data, can reflect the recurring challenges faced in workers' health, interfering in the effective planning and execution of prevention, promotion, and protection actions for workers' health.

As a potentiality, we highlight the unprecedented nature of this research, which described 14 years of NIHL notifications in Brazil, contributing to the reflection and substantiation of actions aimed at workers' health, especially those exposed to noise.

CONCLUSION

There were 7819 cases of NIHL notified in Brazil between the years 2006 and 2019, a number that can be considered disproportionate in relation to the prevalence of this grievance. The observed underreporting impacts the understanding of the problem's dimension and, consequently, the development and implementation of public health actions and programs focused on worker's health and safety.

REFERENCES

1. WHO: World Health Organization. Europe GBD Data and statistics: occupational health [Internet]. Switzerland: WHO Europe; 2017 [citado em 2021 ago 31]. Disponível em: http://www.euro.who.int/en/health-topics/environment-and-health/occupational-health/data-and-statistics
2. Morata TC, Dunn DE, Sieber WK. Occupational exposure to noise and ototoxic organic solvents. Arch Environ Health. 1994;49(5):359-65. http://dx.doi.org/10.1080/00039896.1994.9954988. PMid:7944568.
3. Berglund B, Lindvall T. Community noise, document prepared for the World Health Organization (WHO). Stockholm: Center for Sensory Research; 1995.
4. Safe Work Australia. Key work health and safety statistics [Internet]. Australia: Safe Work Australia; 2010 [citado em 2021 Ago 28]. Disponível em: https://www.safeworkaustralia.gov.au/system/files/documents/1702/key_work_health_safety_statistics_2010.pdf.
5. Mahboubi H, Oliaei S, Kiumehr S, Dwabe S, Djalilian HR. The prevalence and characteristics of tinnitus in the youth population of the United States. Laryngoscope. 2013 ago;123(8):2001-8. http://dx.doi.org/10.1002/lary.24015. PMid:23606449.
6. WHO: World Health Organization. Addressing the rising prevalence of hearing loss [Internet]. Switzerland: WHO; 2018 [citado em 2021 Ago 28]. Disponível em: https://apps.who.int/iris/handle/10665/260336
7. Masterson EA, Bushnell PT, Themann CL, Morata TC. Hearing impairment among noise-exposed workers United States, 2003–2012. MMWR Morb Mortal Wkly Rep. 2016 Apr 22;65(15):389-94. http://dx.doi.org/10.15585/mmwr.mm6515a2. PMid:27101435.
8. Brasil. Ministério da Saúde. Portaria nº 777, de 28 de abril de 2004. Dispõe sobre os procedimentos técnicos para a notificação compulsória de agravos à saúde do trabalhador em rede de serviços sentinela específica, no Sistema Único de Saúde – SUS. Diário Oficial da União [Internet]; Brasília; 29 abr 2004 [citado em 2021 ago 25]. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2004/prt0777_28_04_2004.html
9. Gusmão AC, Meira TC, Ferrite S. Fatores associados à notificação de perda auditiva induzida por ruído no Brasil, 2013-2015: estudo ecológico. Epidemiol Serv Saude. 2021 Jun;30(2):e2020607. http://dx.doi.org/10.1590/s1679-49742021000200018. PMid:34076209.
10. Galdino A, Santana VS, Ferrite S. Os centros de referência em saúde do trabalhador e a notificação de acidentes de trabalho no Brasil. Cad Saude Publica. 2012;28(1):145-59. http://dx.doi.org/10.1590/S0102-311X2012000100015. PMid:22267074.
11. Aguiar PA. Carga da perda auditiva induzida por ruído: gênero e área geográfica [Trabalho de Conclusão de Curso]. Salvador: Universidade Federal da Bahia; 2018 Jul 6 [citado em 2022 fev 14]. Disponível em: http://repositorio.ufba.br/ri/handle/ri/26325
12. Matos GG. A perda auditiva induzida por ruído no Programa Nacional de Atenção à Saúde Auditiva da prefeitura do Rio de Janeiro [tese]. Rio de Janeiro: Escola Nacional de Saúde Pública Sérgio Arouca – Fundação Oswaldo Cruz; 2020.
13. Brasil. Ministério da Economia. Secretaria Especial de Previdência e Trabalho. Portaria 6.734 de 09 de março de 2020. Aprova a nova redação da Norma Regulamentadora nº 07 - Programa de Controle Médico de Saúde Ocupacional - PCMSO. Diário Oficial da União [Internet]; Brasília; 13 Mar 2020 [citado em 2021 set 04]. Seção: 1. Disponível em: https://www.in.gov.br/web/dou/-/portaria-n-6.734-de-9-de-marco-de-2020-247886194.
14. Centro Colaborador da Vigilância aos Agravos à Saúde do Trabalhador. Sistema de Informação de Agravos de Notificação – Sinan. Banco de notificações de PAIR no Sinan [Internet]. 2018 [citado em 2021 ago 19]. Disponível em: http://www.ccvisat.ufba.br.
15. Confederação Nacional da Indústria. Perfil da Indústria nos Estados [Internet]. 2020 [citado em 2021 out 08]. Disponível em: https://perfildaindustria.portaldaindustria.com.br/ranking.
16. Confederação Nacional da Indústria. Perfil da Indústria nos Estados [Internet]. 2020 [citado em 2021 out 08]. Disponível em: https://perfildaindustria.portaldaindustria.com.br/ranking?cat=3&id=3560.
17. Gopinath B, McMahon C, Tang D, Burlutsky G, Mitchell P. Workplace noise exposure and the prevalence and 10-year incidence of age-related hearing loss. PLoS One. 2021;16(7):e0255356. http://dx.doi.org/10.1371/journal.pone.0255356. PMid:34329348.
18. Guerra MR, Lourenço PM, Bustamante-Teixeira MT, Alves MJ. Prevalência de perda auditiva induzida por ruído em empresa Metalúrgica. Rev Saude Publica. 2005 Abr;39(2):238-44. http://dx.doi.org/10.1590/S0034-89102005000200015. PMid:15895144.
19. Brasil. Ministério da Saúde. Boletim da vigilância dos agravos à saúde relacionados ao trabalho: PAIR, Informe do Centro Colaborador PISAT/ISC/UFBA - MS/DSAST/CGSAT [Internet]. Brasil: Plataforma RENAST; 2013 [citado em 2021 set 27]. Disponível em: https://renastonline.ensp.fiocruz.br/sites/default/files/arquivos/recursos/BOL7_PAIR.pdf
20. Assunção AA, Abreu MNS, Souza PSN. Prevalência de exposição a ruído ocupacional em trabalhadores brasileiros: resultados da Pesquisa Nacional de Saúde. Cad Saude Publica. 2019 Apr;35(10):e00094218. PMid:31596395.
21. Feder K, Michaud D, McNamee J, Fitzpatrick E, Davies H, Leroux T. Prevalence of Hazardous Occupational Noise Exposure, Hearing Loss, and Hearing Protection Usage Among a Representative Sample of Working Canadians. J Occup Environ Med. 2017 Jan;59(1):92-113. http://dx.doi.org/10.1097/JOM.0000000000000920. PMid:28045804.
22. Gonçalves CG, Dias A. Três anos de acidentes do trabalho em uma metalúrgica: caminhos para seu entendimento. Ciênc Saúde Coletiva. 2011 Feb;16(2):635-46. http://dx.doi.org/10.1590/S1413-81232011000200027.
23. Brasil. Lei nº 8.213 de 24/07/1991. Diário Oficial da União [Internet]; Brasília; 25 jul 1991 [acesso em 2022 fev 15]. Disponível em: https://legis.senado.leg.br/norma/550089.
24. Cordeiro R, Sakate M, Clemente AP, Diniz CS, Donalisio MR. Subnotificação de acidentes do trabalho não fatais em Botucatu, SP, 2002. Rev Saude Publica. 2005 Apr;39(2):254-60. http://dx.doi.org/10.1590/S0034-89102005000200017. PMid:15895146.
25. Santana VS. Sistemas de informação em saúde do trabalhador. Rev Bras Med Trab. 2019;17(1):34-5. http://dx.doi.org/10.5327/Z1679443520191 7S1014. PMid:32270107.
26. Pedroso HC, Gonçalves CG, Areosa J. Trajetória de trabalhadores com perda auditiva induzida por ruído na rede de assistência à saúde do sul do país. Res Soc Dev. 2021 Feb;10(2):e4610212187. http://dx.doi.org/10.33448/rsd-v10i2.12187.
27. Correa PRL, Assunção AA. A subnotificação de mortes por acidentes de trabalho: estudo de três bancos de dados. Epidemiol Serv Saude. 2003;12(4):203-12. http://dx.doi.org/10.5123/S1679-49742003000400004.
28. Ferreira MJ, Lima RK, Silva AM, Bezerra Filho JG, Cavalcanti LP. Vigilância dos acidentes de trabalho em unidades sentinela em saúde do trabalhador no município de Fortaleza, Nordeste do Brasil. Ciênc Saúde Colet. 2017 Oct;22(10):3393-402. http://dx.doi.org/10.1590/1413-812320172210.17422017.
29. Kim Y, Jeong I, Hong OS. Predictors of hearing protection behavior among power plant workers. Asian Nurs Res. 2010 Mar;4(1):10-8. http://dx.doi.org/10.1016/S1976-1317(10)60002-3. PMid:25030789.
30. Tinoco HC, Lima GBA, Sant'Anna AP, Gomes CFS, Santos JAN. Percepção de risco no uso do equipamento de proteção individual contra a perda auditiva induzida por ruído. Gest Prod. 2019 Mar;26(1):e1611. http://dx.doi.org/10.1590/0104-530x1611-19.