

Regulatory Standards and Work Safety: A Review of Literature and Research Directions

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Abstract

Since the first initiatives related to health and safety at work there has been a lot of progress in this area. However, there is still a lot to be improved, especially in Brazil, since the country is among the countries with the highest number of accidents at work and in academic terms, represents a low participation in the scientific production in the area. Thus, given the context, this article aims to review the literature on regulatory norms and occupational safety, identifying gaps and research opportunities related to the area. The results indicate an increase in the relevance of the theme, however the majority of the studies present a fragmented and punctual approach. Regulatory norms 15 and 32 were the most frequent, and the industrial and health sectors were the predominant ones.

Keywords: Regulatory Norms; Occupational safety; Literature review.

1. Introduction

There are several risks associated with work that, if not controlled, can generate damages to workers and burdens to society as a whole (Reis and Kitamura, 2016). In this sense, societies seek ways to establish norms to control working conditions and guarantee workers' occupational health. The first law initiative concerning the protection of workers arose in England in 1802 with the "law of health and morals of apprentices," however, it was only in 1833 that the first effective legislation for the protection of the worker, the "Factory Act "(BITENCOURT; KELHAS, 1998).

Working conditions vary from country to country, as well as in different regions of the same country. Specifically in Brazil, the history of legislation against work accidents began in 1919 with the imposition of preventive regulations on the rail sector. The most extensive regulation to other sectors arose in 1934, however, it was on June 8, 1978 that was created Portaria no. 3,214, which approves the Norms Regulating (NR) on Occupational Safety and Medicine, and that forces companies (BITENCOURT; KELHAS, 1998). Since then, NRs have been updated in an attempt to adapt and improve working conditions and worker safety.

However, while Brazil has evolved as regards labor security issues, the country is still among the countries with the highest number of accidents at work (MPT, 2018). According to the Statistical Yearbook of Occupational Accidents (AEAT) released by the Social Security Secretariat in 2017, Brazil recorded 549,405 work-related accidents that year, representing more than 1,500 accidents per day with the majority of male victims (66%). . Of this total, 62% were typical accidents, 18% of the way, 2% of work and the remaining 18% were without a work accident report (CAT). These numbers indicate the need to continuously improve health and safety at work, since in practice, the proposed objectives related to occupational health have not been fully achieved (MINAYO-GOMEZ; THEDIM-COSTA, 1997; ROCHA, 2011) .

In academic terms, the literature indicates a lack of broad literature review studies that aim to identify the evolution of publications in this area over the years, the main sectors under study, and essentially identify the gaps in this area of knowledge. The studies with a more theoretical or revision approach, generally focus on certain areas or NR (eg DE FARIA GIL ROSA et al., 2008, SPER et al., 2015, REIS, KITAMURA, 2016, LIMA et al. ., 2017). The literature review is the appropriate method when it is desired to reinforce the proposed research question, to avoid duplication of research on the same theme and, thus, to justify the research differential, from the identification of gaps (SILVA; MENEZES, 2001; PARÉ et al., 2015).

Thus, there is still much to be explored in both practical and theoretical terms regarding health and safety at work in Brazil. Based on this context and understanding the need for studies in the area, it is possible to emerge the following research question: What are the gaps in the area of NR knowledge and work safety? In this context, this article aims to review the literature on regulatory norms and work safety, identifying gaps and research opportunities related to the subject. In addition to this introductory section, this article is structured as follows: section 2 gives a brief literature review, while section 3 describes the method used. Section 4 presents the results and, finally, section 5 concludes.

2. Literature Revision

In all, there are 37 NRs consisting of obligations, rights and duties to be fulfilled by employers and workers in order to guarantee safe and healthy work, preventing the occurrence of diseases and accidents at work. These NRs are drafted and reviewed by the Ministry of Labor, through groups and commissions composed of representatives of government, employers and employees. Although there has been considerable progress in labor safety issues since the creation of standards, there is also a need to stimulate knowledge of current occupational safety and health legislation, to improve and disseminate behavior and procedures in this area, and to intensify oversight, both internally and externally (SILVA, SANTOS, 2014).

This need to stimulate knowledge of legislation is present not only in practice, but also in literature. Mendes (2003) evaluated in the period from 1950 to 2002 master's dissertations and doctoral theses in the area of health and work and, through his survey, it was evident the predominance of the construction of fragmented, unidisciplinary knowledge, resulting from researches and punctual analyzes (GOMEZ and LACAZ, 2005).

More recent publications still point to this punctual and unidisciplinary trend of analysis. De Faria Gil Rosa et al. (2008), for example, focused their studies on the analysis of scientific production in the period from 1996 to 2006 on RSI / DORT in nursing workers. The study by Sper et al. (2015) aimed to analyze, from the literature, the relationship between the incorporation of safety devices in sharp instruments and the occurrence of work accidents with the use of these instruments, involving health professionals. This study analyzed a total of 14 articles published between the years of 2006 and 2014.

Reis and Kitamura (2016) focused on their narrative review of the literature in NR 7, more specifically on the verification of the applicability of the audit of the Occupational Health Medical Control Program within the Brazilian model of state control in occupational health. The results of this study indicate that punitive and remedial norms and punitive and repressive supervision fail both to reduce expenditures on work-related diseases and to encourage voluntary compliance with the law.

Another example of a theoretical study with a more punctual approach can be observed in Lima et al. (2017), which aimed to identify the practices and main difficulties related to occupational management in health care companies, through the analysis of articles published in the period from 2008 to 2016. This study cites NR 32 as a measure to improve occupational health and consequently for the reduction of accidents at work.

It is estimated that of the total number of scientific articles published worldwide per year, focusing on the relationship between work and health, Brazilian production represents less than 1% (WÜNSCH FILHO, 2004). In addition, there is an aggravating factor in Brazil that concerns the lack of connection between research and practical application. Thus, there are indications that, although scientific production in the area of occupational health and safety has increased significantly since the 1990s (GOMEZ; LACAZ, 2005), there are still gaps to be filled in the area in question.

3. Methodological Procedures

The present study will follow 5 main steps, which are described below.

In step (i) a bibliographic survey will be carried out on studies that cite NR in some way. To obtain the bibliographic portfolio (PB), the term "regulatory standard" will be used as a keyword to retrieve the publications in the following Web of Science and Gale (OneFile) databases. These bases were used because they were indicated by the Capes journals among the ones that have more works in the area. From the works found through this search, a filtering process is carried out, in which the publications are evaluated regarding the relevance for the present research. There is no temporal delimitation of publications.

Step (ii) seeks to evaluate the PB regarding the number of publications over the years. The general objective of this stage is to identify the period in which the literature began to present studies in the field of NR and work safety, as well as the current relevance of the subject through the increase or not of the number of publications.

The list of the magazines with the largest publications in the area is carried out in step (iii). This stage aims to help researchers and interested professionals to seek knowledge on bases that invest greater efforts in the subject.

In step (iv) we seek to identify the NR and the sectors that appear most in the literature. The purpose of conducting a survey of the regulatory norms and sectors most covered in the studies is mainly to enable the identification of research trends and possibly to evaluate if the organizations are complying with the legislation in question. In addition, this survey allows the identification of the need for studies in the less frequent areas.

Step (v) seeks, from the results of previous steps, to indicate gaps in the literature and research opportunities. The identification of gaps is essential to contribute to the area of knowledge, since it aims to assist researchers by directing their research and thus filling the deficits of the literature.

3. Results

When performing the search process with the keyword and the bases defined in step (i), a total of 166 articles resulted. Applying the filtering process regarding the relevance of these works for the present research, a total of 103 articles were obtained that compose the PB.

After defining PB, it was evaluated the evolution of publications over the years, as shown in Figure 1. From this analysis it is possible to observe that publications began to emerge from 2003, with a significant increase from 2013, indicating the relevance and relevance of the theme and, above all, that efforts have been invested to increase knowledge in this area.

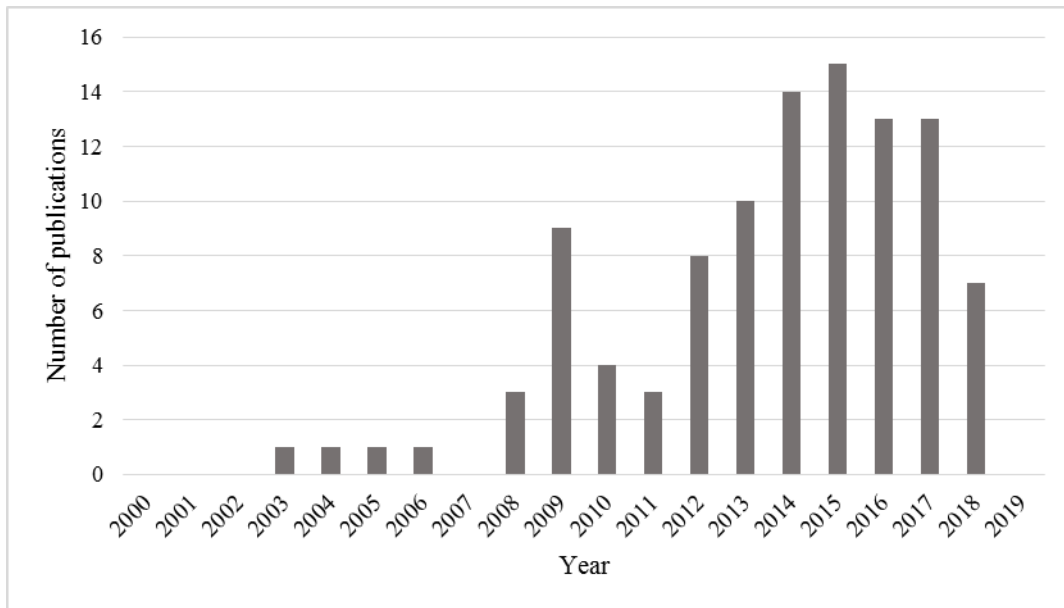


Figure 1 - Number of publications over the years

With regard to the journals with the largest publications in the area, which consists of stage (iii), the analysis of PB presented a total of 30 journals and indicated the Brazilian Journal of Occupational Medicine as the one with the largest number of publications, accounting for 29.13% of PB, thus contributing the most to the area. Then, with 17.48%, is the CEFAC Magazine. The journals *Ciência & Saúde Coletiva* and *Enfermagem Uerj* have 8.74% of the publications each, and the other 26 journals have a number equal to or less than 6 in publications in the area. In Figure 2 it is presented as "other magazines" those that only have one publication.

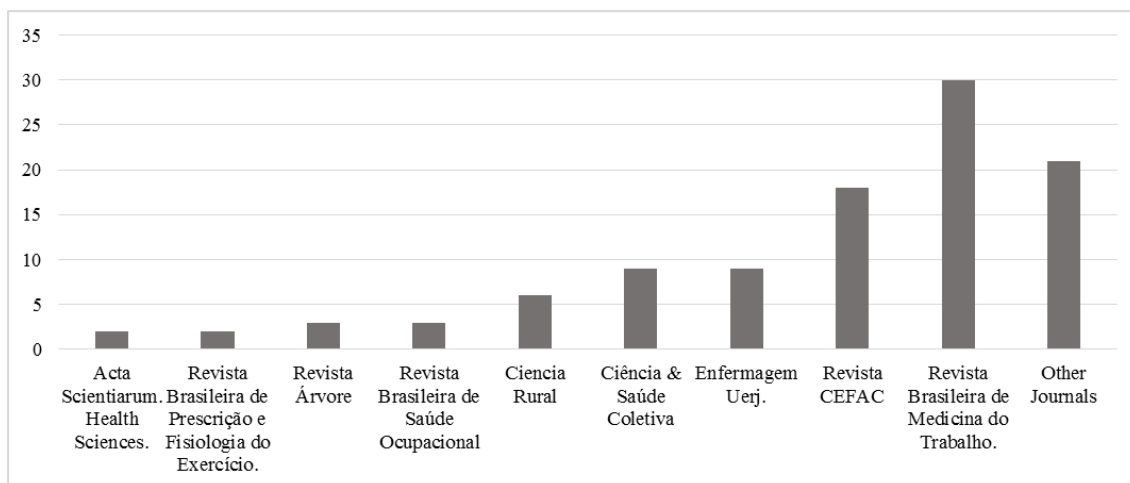


Figure 2 - Journal with major publications

From stage (iv), 17 NR were identified, with NR 15 and 32 being the most frequent, according to Table 1. NR 15 deals with unhealthy activities and operations, which may result in additional insalubrity for workers. The greater presence of this NR in the literature can be justified precisely because it is a rule directly related to worker health and that can generate "additional costs" to the company. However, some studies have pointed out the lack of compliance with the additional unhealthiness or measures aimed at

controlling the unhealthy environment, indicating the neglect of some organizations regarding the health of their collaborators (Oliveira et al., 2015).

Regulatory Norm	Number of publications
15	27
32	27
7	23
17	17
6, 9	15
35	6
31	3
4	2
5, 12, 16, 22, 24, 29, 30, 36	1

Table 1 - Regulatory Norms in BP

NR 32 was established in 2005 with the purpose of establishing the basic guidelines for the implementation of measures to protect the health and safety of health service workers, as well as those who carry out health promotion and assistance activities in general. The literature indicates that health services have invested in the adequacy of the working conditions of their employees, but the need for improvement is still perceptible, since the professionals themselves are resistant to change (eg KON et al. ., 2011; LIMA et al., 2017).

Regarding the sectors, it is predominant in the PB the presence of studies in the industrial area, corroborating with the study of Mendes (2003). However, as a result of the high frequency of studies that address NR 32, a great number of studies in the health area are also perceived. In general, PB covers several areas, as can be seen in table 2.

Area	References
Agribusiness	MAIA; RODRIGUES (2012)
Biodiesel plant	DE ASSIS <i>et al.</i> (2017)
Car wash	ZANI <i>et al.</i> (2017)
Clothing making	DA SILVA <i>et al.</i> (2009); BARCELOS; DE ATAÍDE (2014)
Construction	FARIAS <i>et al.</i> (2012); ALVES <i>et al.</i> (2013); SILVA; SANTOS (2014); BURLE <i>et al.</i> (2016)
Dairy	GUIMARÃES (2008)
Education	IWAMOTO <i>et al.</i> (2008); GONÇALVES <i>et al.</i> (2009); SANGIONI <i>et al.</i> (2013); SANTOS <i>et al.</i> (2013); DE OLIVEIRA; BARRETO (2017)
Environmental	DAGUIAR <i>et al.</i> (2009)
Expertise	DE OLIVEIRA (2016)
Farming	HAEFFNER <i>et al.</i> (2016)

Fire department	LIMA BARBOSA <i>et al.</i> (2014)
Fishing industry	HEUPA <i>et al.</i> (2011)
Food	MOREIRA; GONÇALVES (2014)
Forest	BASSO <i>et al.</i> (2012)
Furniture Factory	PETUSK FILIPE <i>et al.</i> (2014)
Health sector/hospital	ROBAZZI; MARZIALE (2004); DE FARIA GIL ROSA <i>et al.</i> (2008); DA CUNHA; CHAVES MAURO (2010); KON <i>et al.</i> (2011); FROTA <i>et al.</i> (2012); LAPA <i>et al.</i> (2012); MARZIALE <i>et al.</i> , (2012); ALBUQUERQUE <i>et al.</i> (2013); AMORIM <i>et al.</i> (2013); LAROTTA <i>et al.</i> (2013); PIVATTO; GONÇALVES (2013); SILVEIRA <i>et al.</i> (2013); FILUS <i>et al.</i> (2014); FONTOURA <i>et al.</i> (2014); INÁCIA BRAND; TERESINHA FONTANA, (2014); COSTA <i>et al.</i> (2015); MARTINS <i>et al.</i> (2015); MARZIALE <i>et al.</i> (2015); ROCHA <i>et al.</i> (2015); SANTOS JUNIOR <i>et al.</i> (2015); SPER <i>et al.</i> (2015); DA SILVA <i>et al.</i> (2016); REZENDE <i>et al.</i> (2016); CORRÊA <i>et al.</i> (2017); DE AGUIAR <i>et al.</i> (2017); LIMA <i>et al.</i> (2017); ALMEIDA (2018)
Marketplace	MAZINI FILHO <i>et al.</i> (2015)
Metallurgy	ALVES; DELLA ROSA (2003); GONÇALVES <i>et al.</i> (2009); POLANSKI <i>et al.</i> (2015); RIBEIRO <i>et al.</i> (2016)
Military	NEVES <i>et al.</i> (2009); NEVES; SOALHEIRO (2010)
Mining	IRAMINA <i>et al.</i> (2009)
Organic agriculture	GEMMA <i>et al.</i> (2010)
Petroleum	FELIPE-DE-MELO <i>et al.</i> (2011)
Plastic packaging company	ICHIDA <i>et al.</i> (2009)
Poultry	LOURENÇONI <i>et al.</i> (2015)
Railway port	COSTA <i>et al.</i> (2015)
Refrigeration industry	OLIVEIRA; MENDES (2014)
Restaurant	DE CARVALHO <i>et al.</i> (2012); MEDEIROS <i>et al.</i> (2017)
Rural	DUARTE <i>et al.</i> (2016)
Shipbuilding	MOREIRA <i>et al.</i> (2016)
Steel industry	FERREIRA <i>et al.</i> (2012)
Sugar and alcohol	GONZAGA <i>et al.</i> (2005)
Telemarketing	CEZAR PERES <i>et al.</i> (2006); BALASTEGHIN <i>et al.</i> (2014)
Traffic management	DE CARVALHO ROCHA <i>et al.</i> (2013)
Transformation industry	CAVALCANTE <i>et al.</i> (2013)
Transport	OLIVEIRA <i>et al.</i> (2015); SANTANA; ZANNIN (2016); DE CONTO <i>et al.</i> (2018)
Woodwork	FIEDLER <i>et al.</i> (2009); FIEDLER <i>et al.</i> (2010)

Table 2 - Areas present in BP

Finally, PB indicates gaps and research opportunities in several RNs, especially those less frequent or not mentioned in Table 1. Moreover, even if we perceive a range of sectors and areas present in the studies, the approach is still fragmented and punctual. Thus, there are few studies that critically analyze work environments with a broader approach to norms.

Another important aspect to be mentioned is related to the majority of the studies having a more theoretical and descriptive approach. Studies that not only describe the situation, but which propose measures / methods of improvement or adequacy (when applicable) for companies to apply in practice, would contribute both to the body of knowledge and to managers with the adequacy of their work environments.

In addition, studies are proposed that compare the indicators related to occupational safety and health before and after some improvement or adequacy to the NR (s), since this approach is not very present in the initial CP. Thus, in addition to contributing to the literature, this type of study would provide a foundation, structure and incentive for managers to continuously improve worker safety and health aspects.

4. Conclusion

This article aimed to present a review of the literature on regulatory norms and work safety, identifying gaps and research opportunities related to the subject. The Web of Science and Gale (OneFile) databases were used because of their relevance in the area, and the final CP was evaluated in terms of the number of publications per year, the magazines that contribute most to the area and the NR and most frequent sectors.

The PB was formed by 103 articles, and the first publications began to appear in 2003. From 2013 it was noticed a significant increase of publications in the area, indicating the increase of the relevance of this area. Among the journals present in PB, the Brazilian Journal of Occupational Medicine presented the largest number of publications, with a total of 29.13% of PB. With regard to the most frequent NR, NR 15 and NR 32 appeared in a greater number of studies. Regarding the sectors, it was noted that in PB there is a wide range of areas studied, however, the industrial and health sectors were predominant.

From the PB analysis, it was possible to identify the trend of scientific production in the analyzed bases in the area of regulatory regulation and work safety, as well as to identify research opportunities. The main research opportunities identified are: (i) a broader approach to NR, (ii) a more practical approach, proposing methods for NR adequacy, and (iii) studies comparing indicators related to occupational safety and health before and after some improvement or suitability for NR (s). In this way, the present article contributes so much to the theory directing future researches to fill gaps, as with the practice disseminating knowledge so that managers can apply them in their work environments.

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