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THE IMPACT OF PESTICIDE USE IN THE MENTAL HEALTH OF BRAZILIANS: A SCOPING REVIEW

Tamara Rodrigues Lima Zanuzzi*[1], Caroline Volpato Weyrich[2] and Edlaine Faria de Moura Villela[3]

[1]Master's student in the Postgraduate Program of Public Health at the Federal University of Goiás (UFG), Brazil
[2]Pharmacy Degree from the Paulista University (UNIP), Brazil
[3]Doctor in Epidemiology from the School of Public Health of the University of São Paulo (USP), Brazil

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Corresponding author:
Tamara Rodrigues Lima Zanuzzi

ABSTRACT

Using pesticides causes much harm to human health and degradation in the environment. Hence, this study aimed to describe the relationship between pesticide use and psychiatric disorders in the Brazilian population. Method: This scoping review encompassed articles published between 2006 and 2016. The following descriptors were used: pesticide use; pesticide exposure; mental health; psychiatric disorders; psychological health; madness; mental illnesses; nerve diseases; psychopathology. A total of 17 articles were selected – eight descriptive studies, seven cross-sectional studies, one cohort study, and one ecological study. Approximately 84% of the studies showed a positive association between pesticide exposure and mental disorders. About 66% of the studies showed the relationship between contact with pesticides and suicide rates. The silent danger of pesticide poisoning can lead to the development of health problems, such as immune, hematological, hepatic, and neurological problems, congenital malformations, among others. These eventually can (and usually do) trigger psychiatric disorders such as depression and anxiety, which consequently contributes to the high suicide attempt rates. It was found that the association between mental health impairment and pesticide exposure is a public health issuegenerally affecting various Brazilian states.

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INTRODUCTION

Pesticide use in the environment has been a great concern in epidemiological studies, due to their impact on human life. According toFaria *et al*. (1999), Siqueira (2006), Albuquerque *et al*. (2015), and Araújo *et al*. (2007), Brazil is one of the largest and main pesticide consumers and producers in the world. According toMazonand Steff (2012), consuming pesticides causes much harm to human health and degradation in the environment. Regarding the population's health, the consequences involve poisoning and dysfunctions in the neurologic, immune, reproductive, metabolic, and endocrinal systems, to name some. The Brazilian decree no. 4.074, of January 4, 2002, which regulates the Law no. 7802/1989 (BRASIL, 2002), defines pesticides as products and agents with physical, chemical, or biological processes, designed to be used in producing, storing, and processing agricultural goods.

The pesticides have the purpose of changing the composition of the fauna or flora, to protect them from damage caused byharmful living beings (Siqueira, 2006). The mutagenic and genotoxic potential of pesticides interferes significantly with the environment and population's health. Faria *et al*. (1999) state that there is a significant association between pesticide poisoningand psychiatric disorders. The authors also highlight the importance of implementing public mental health policies aimed at reducing pesticidepoisoning. ABRASCO's (Brazilian Public Health Association) dossier describes that in the last years the consumption of pesticides per area of production has been increasing, due to the expansion of monoculture lands, increase in crop diseases, and decrease in the costs of the pesticides (Carneiro *et al*, 2012). Using pesticides indiscriminately and exaggeratedly has caused significant consequences on the mental health of the Brazilian population. The various psychosocial and neuropsychic factors involved in pesticide exposure can lead to the onset of psychiatric disorders, such as schizophrenia, delusional disorders, sexual

dysfunctions, depression, anxiety disorders, sleep disorders, among others (LevigardandRozemberg, 2014). According to Pancotto (2013), the most common mental disorders associated with pesticide poisoningspresent signs such as fatigue, irritability, forgetfulness, insomnia, difficulties concentrating, and complaints in general, which reflect mental suffering. Bhatt *et al*. (1999), cited byCassal *et al*. (2014) in a study on pesticide exposure, present data evidencing that the increase in neurodegenerative diseases, especially Parkinson's disease, may be associated with pesticides. Other manifestations observed in farmworkers who had been in contact with pesticides were anemia, male sexual impotence, insomnia, arterial pressure alterations, behavior disorders, mood alterations, and others (Cassal *et al*. 2014). According to Pancotto (2013), the current epidemiologic studies revealing the relationship between mental health and pesticide use state that psychiatric disorders resulting from poisoning are one of the causes of disability and morbidity in the population. According to this author, data from the Brazilian Ministry of Health indicate that five out of the ten main causes of disability are psychiatric disorders. Given the above, the need for producing this study was felt, to better understand the current context of the impact pesticides has on farmworkers' health. This research aimed to analyze the relationship between pesticide use and psychiatric disorders in the Brazilian population from 2006 to 2016.

MATERIALS AND METHODS

This scoping review aimed at identifying and systematizing scientific evidence, conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses – PRISMA (Moher *et al*., 2009). It investigated the epidemiological aspects of the relationship between pesticide use and mental health in Brazil throughout the past ten years. This descriptive researchselected recent studies relevant to an epidemiologic discussion on pesticide use and mental health. For the data collection, scientific articles published between 2006 and 2016 were searched in the following databases: Medical Literature Analysis and Retrieval System Online/PubMed (MEDLINE), Scientific Electronic Library Online (SciELO), Latin American and Caribbean Health Sciences Literature (LILACS), and CAPES journals. The search for scientific articles in the virtual databases was based on the following descriptors:pesticide use; pesticide exposure; mental health; psychiatric disorders; psychological health; madness; mental illnesses; nerve diseases; psychopathology. Only the articles in whose abstract these descriptors are present were considered. The abstract of all the articles found was read. When reading the abstract was not enough to define whether the article would be included, it was fully read to come to a decision.A table for extracting data from the studies was developed, containing the following information: authors, year of publication, the title of the study, journal of publication, database, type of study, sample, and place of the study. This study has no conflict of interests and complies with the precepts from the Resolution no. 466/12 of the Brazilian National Health Council, which regulates human research (BRASIL, 2012). The whole research was based on data from studies published on electronic databases.

RESULTS

This scoping review selected 17 articles – eight descriptive studies, seven cross-sectional studies, one cohort study, and one ecological study. Approximately 84% of the studies had a positive association between pesticide exposure and mental disorders. However, many of these associations are limited regarding the various symptoms involving mental disorders, as they are subjectively detected and difficult to confirm in a diagnosis. About 66% of the studies presented a relationship between contact with pesticides and suicide rates. Approximately 55% of the studies documented that the main pesticides that impaired human health were organophosphates and carbamates. Other aspects presented in some articles refer to alcohol abuse, smoking, low schooling level, underreporting and lack of information, lack of inspections, inadequatelydiscarding pesticide, and the use (or not) of personal protective equipment(PPE). Of the 17 final articles selected, 47% were descriptive studies that used databanks, as the Reported Impairment Information System (SINAN, in Portuguese), Toxicologic Assistance and Information Centers from various Brazilian states, Mortality Information System (SIM, in Portuguese), and others. The flowchart in Figure 1 gives the detailed stages in the article selection and exclusion process.

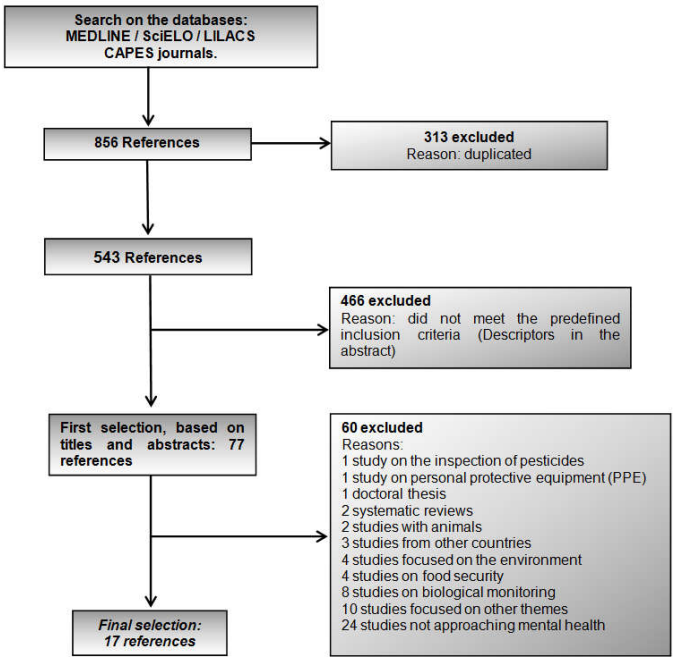

Figure 1. Flowchart of the selection of studies for the scoping review on the relationship between pesticide exposure and mental health

About 41% were cross-sectional studies with epidemiologic, clinical, and laboratory aspects of pesticide exposure in relation to mental health. One article was an ecological study aimed at identifying epidemiological aspects associated with suicide and pesticide use in 35 microregions. Another article is a cohort study on health impairments related to pesticide exposure.

DISCUSSION

Even with the much evidence and research on the consequences of pesticides on human health, a great part of farmworkers has no adequate assistance, which contributes to their permanent exposure to the risks posed by pesticides (Campos *et al*., 2016). The silent danger of pesticide poisoning can lead to the onset of health impairments, such as immune, hematologic, hepatic, and neurological problems, and

congenital malformations, to name some, which eventually can (and usually do) trigger psychiatric disorders, such as depression. Consequently, this contributes to the high rates of suicide attempts (Neves and Bellini, 2013; Souza *et al*., 2011). Compared to other occupational groups, farmworkers have a higher prevalence of mental disorders, of which the most frequent are depression and anxiety. Pesticides can affect the mechanisms that produce neurotransmitters and thyroid hormones, possibly causing significant behavioral alterations (Campos *et al*., 2016). The articles selected for this scoping review described a variety of relevant data, of which the main ones are given in Table 1.

Table 1. Main results of the articles selected for the systematic review ofpesticide use and psychiatric disorders

Authors	*Main results regarding pesticide exposure and mental health*
Albuquerque et al. (2015)	Poisoning was more frequent in young adults with low schooling level. Some pesticides are neurotoxic and can cause depression and mental disorders, culminating in suicide.
Araújo et al. (2007)	Of the sample, 12.8% were diagnosed with delayed neuropathies and 28.5%, withneurobehavioral syndromes and neuropsychiatric disorders associated with chronic pesticide use.
Araújo et al. (2013)	In many of the cases, the subjects had diffuse symptoms of physical and mental illness that might be associated with the effects of contact with pesticides, precarious working conditions, and psychosocial vulnerability.
Campos et al. (2016)	The prevalence of common mental disorders and self-reported depression in the sample was 23% and 21%, respectively.
Cavalcante et al. (2014)	A total of 2,180 cases were reported, including seven of the nine work-related mandatorily reportable impairments and diseases: biological accidents, serious accidents, exogenous poisoning, mental disorders, pneumoconiosis, and dermatosis.
Cezar-Vaz et al. (2016)	The health disorders reported in the results include mental (62.2%), circulatory (49.8%), dermatological (45%), respiratory (41%),and gastric disorders (36.2%).
Faria et al. (2006)	The schooling level is a protective factor for various health problems, including farmworkers' mental health.
Faria et al. (2009)	Significant neuropsychiatric effects in cases of exposure to organophosphates.
Hoshino et al. (2008)	The results show that 16 workers had peripheral irritative postural balance alterations, and 7 workers had sensorineural hearing loss. This suggests that pesticides induce alterations in the vestibular system in a slow and silent poisoning process.
Malaspina et al. (2011)	Given the results, a need was verified for qualifying the health professionals and conducting integrated actions involving mental health in the populations' health care.
Meyer et al. (2010)	The results show that the risk of death by suicide associated with mental health problems was significantly greater among farmworkers who lived in areas of the state of Rio de Janeiro whose rates of expenditures with pesticide per worker were higher.
Neves and Bellini (2013)	Suicide attempts appear as the main cause of hospitalization (possibly disguising chronic poisoning). The main agents involved inpoisoning are insecticides(62.60%) and herbicides (26%).
Peres andMoreira (2007)	Various nervous system disorders were associated with the exposure to organophosphate pesticides, especially those related to the neurotoxicity of these products, observed in delayed neurological effects.
Rebelo et al. (2011)	A great part of the occupational poisoning with agricultural pesticides and the high suicide rates take place in the countryside.
Silva et al. (2013)	The morbidities most reported by older adults living in the countryside and exposed to pesticides were insomnia, anxiety, depression, diabetes, and Alzheimer's disease.
Siqueira et al. (2012)	Using and handling pesticides interfered with the variables analyzed regarding physical and psychological health and social relations. The mental health analysis of farmworkers exposed to pesticide poisoning highlighted the presence of psychiatric disorders, suicide attempts, and symptoms such as headache, nervousness, eyesight problems, anxiety, and depression.
Souza et al. (2011)	Of all the interviewees, 68.4% were farmworkers, and 74.8% of thesebelonged to families of farmworkers and had contact with pesticides. Both the direct and indirect contact with pesticides were associated with the report of various diseases, of which the most prevalent were the neurological and oral ones.

Malaspina *et al*. (2011) present alarming data from the World Health Organization (WHO), estimating that three million people are poisoned with pesticides every year worldwide, resulting in 220 thousand deaths. Siqueira *et al*. (2013), Peres and Moreira (2007), and Hoshino *et al*. (2008) state that the main poisoning symptoms presented by pesticide-exposed workers are headache, vertigo, fatigue, insomnia, nausea, vomits, cramps, muscle weakness, dizziness, cognitive and neurological disorders, attention deficit, amnesia, mental confusion, visual disorders, convulsions, and others. Hoshino *et al*. (2008) add symptoms such as eye irritation, speech comprehension difficulties, tinnitus, and hearing loss. Malaspina *et al*. (2011) also reported the abovementioned signs and symptoms, adding diarrhea, tingling, colic, arrhythmia, dyspnea, and epigastric pain. Silva *et al*. (2013) report that some morbidities related to pesticide exposure are hypertension, rheumatism, depression, and anxiety disorders, especially in older adults. There is a difficulty in reaching a precise diagnosis regarding psychiatric disorders and pesticide exposure, as it requires the analysis of the farmworkers' psychosocial context and working conditions. The indiscriminate use of pesticides, the precarious working conditions, the lack of protective equipment, family problems, unfavorable socioeconomic condition, and debilitated physical health are some of the factors that can significantly influence a psychiatric disorder diagnosis (Araujo *et al*., 2013). Farmworkers suffer extensivepesticide exposure and, despite the difficulties in establishing a relationship between pesticide poisoning and psychiatric disorders, Campos *et al*. (2016), Cezar-Vaz *et al*. (2016), Faria *et al*. (2009), Meyer *et al*. (2010), and Peres and Moreira (2007) report important neuropsychiatric effects on poisoned farmworkers.Faria *et al*. (2007), and Peres and Moreira (2007) indicate an association of mental problems among farmworkers exposed to pesticides.In research on pesticide exposure involving 342 farmworkers, Siqueira *et al*. (2013) report the frequent occurrence of signs and symptoms, such as bad mood, anxiety, despair, and depression. Brazil has few studies published on the relationship between pesticide exposure and mental health; the existing research is concentrated on the South and Southeast Regions. Although thereporting systems from various parts of Brazil have data to present, there is evidence in research on the agricultural areas of the country (Figure 2). Albuquerque et al. (2015), Cavalcante et al. (2014), Meyer et al. (2010), andFaria et al. (2009) develop on the issue of underreporting, and scarcity and inconsistency of data, and bring up the unreliability of the information. Such a situation causes great loss to the production of health-related studies, information, and actions that would benefit the population. Rebelo et al. (2011), when analyzing data from SINITOX

(National Drugs and Toxins Information System), found serious difficulties in establishing the agents that caused the poisoning, due to the absent and/or incomplete and/or unreadable data in the system. According to Silva et al. (2013), Peres and Moreira (2007), Rebelo et al. (2011), and Hoshino et al. (2008), another aspect involved in poisoning incidences is the lack of instructions on how to properly discard the pesticide packages.

cases when the worker's interpretation was the opposite of what was written in the package. For Siqueira et al. (2013), the high illiteracy rates (20.5% of a sample of 342 farmworkers) and the low schooling level significantly impairs their work's safety and efficiency. In this regard, Faria et al. (2006)point to the schooling level as a protective factor against the onset of mental disorders, psychiatric hospitalizations, alcoholism, poisoning, and others.

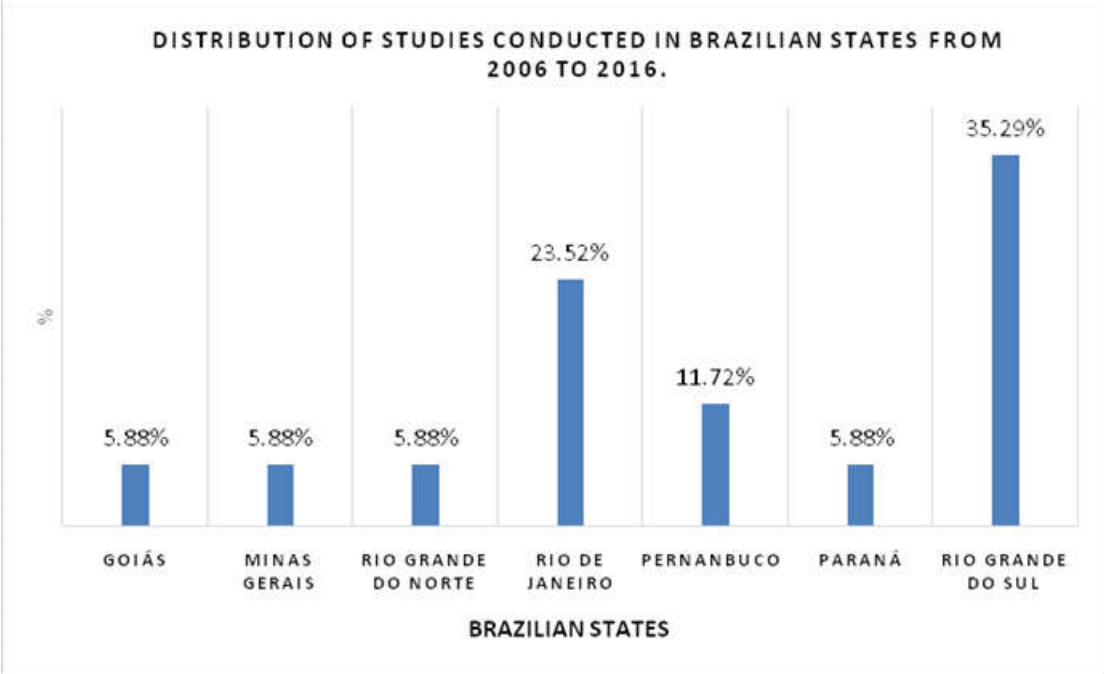

Figure 2. Distribution of studies conducted in Brazilian states from 2006 to 2016

The authors pointed out that a significant part of the workers stated that the packages were dumped in nearby rivers or forest areas and that they had not been trained to handle pesticides. Suicide, though not classified as a neuropsychiatric disorder, gained notoriety in this review. Cezar-Vaz et al. (2016), in a research with farmworkers from Rio Grande do Sul, described that the health disorders found in their research include mental disorders (62.2%), circulatory problems (49.8%), dermatological alterations (45%), respiratory complications (41%), and gastric disorders (36.2%). Neves and Bellini (2013), and Meyer et al. (2010) inform that suicide attempts are the most frequent outcome of pesticide poisoning, evidencing high lethality rates. For Malaspina et al. (2011), Albuquerque et al. (2015), Neves and Bellini (2013), andFaria et al. (2006), the reported cases reveal a predominantly male mortality rate. Neves and Bellini (2013), and Peres and Moreira (2007) explain that the difference between the genders lies on the predominance of men in farmwork. Peres and Moreira (2007), in research conducted in the mountain region of Rio de Janeiro, found that pesticide-exposed workers did not adhere much to wearing PPE. Hoshino et al. (2008) stated that not wearing PPE contributes to a higher incidence of pesticide poisoning and auditory health impairments. Rebelo et al. (2011), and Silva et al. (2013) conclude that people are unaware of the importance of wearing PPE, which can make the likelihood of poisoning increase by approximately 535%. According to Silva et al. (2013), Rebelo et al. (2011), andFaria et al. (2009), alow schooling level is another factor that contributes to the incidence of pesticide poisoning.Peres and Moreira (2007) state that using technical terminology and formal language in the packages of these products hinders comprehension and increases the risk of poisoning. There were

For Peres and Moreira (2007), Cezar-Vaz et al. (2016), Neves and Bellini (2013), Malaspina et al. (2011), Meyer et al. (2010), and Hoshino et al. (2008),the health impairments caused by pesticide exposure poses a great challenge to public health. Hoshino et al. (2008) highlight the importance of qualifying health professionals to recognize pesticide poisoning signs and symptoms, for the diagnosis to be quick and precise. The studies conducted by Peres and Moreira (2007), and Neves and Bellini (2013) conclude that efficient public policies are necessary to monitor and inspect the correct pesticide use in Brazil, as well as decrease it.

Final Considerations

This study presented a significant relationship between pesticide use and mental health impairment. It also points to the fundamental importance of taking health surveillance actions to promote more studies on this specific epidemiological profile in the Brazilian population. Furthermore, it highlights the inconsistency and scarcity of information on the psychological health of the Brazilian population exposed to pesticides, which makes it difficult to establish priorities in public policies, and plan and implement health-oriented initiatives to benefit the population. This paper indicated that pesticide exposure is associated with the increased prevalence of various mental health symptoms and impairments, such as headache, vertigo, fatigue, insomnia, nausea, vomits, cognitive and neurological impairments, attention deficit, amnesia, mental confusion, visual disorders, convulsions, among others. The main psychiatric disorders point to depression and anxiety disorders. In general, the epidemiological disease profile of the pesticide-exposed

population poses a clinical challenge regarding psychiatric problems, which are also usually related to other pathologies. The epidemiological methods and techniques applied to studies involving the association between mental health and pesticides are extremely important to know the Brazilian context, gather data, and present its actual situation. Further studies with an experimental analytical design are made necessary. To this end, the epidemiological methods and techniques must make progress with cooperation between sectors and disciplines, encompassing health, agriculture, science and technology, environment, farmwork and extension, thus producing knowledge and broadening the cooperation towards the good development of the population. The relevance of this theme is an encouragement for new studies to be produced, given that Brazil has a large population of farmworkers exposed to the risks the pesticides represent to health.In conclusion, the association between mental health impairments and pesticide exposure is a nationwide public health issue, which deserves careful attention to mitigate the consequences such exposure brings to the Brazilian population.

REFERENCES

Albuquerque PCC, Gurgel IGD, Gurgel AM, augusto LGS, Siqueira MT (2015). Sistemas de informaçãoemsaúde e as intoxicações por agrotóxicosem Pernambuco. Rev. bras. epidemiol. 18 (3): 666-678.

Araújo AJ, Lima JS, Moreira JC, Jacob SC, Soares MO, Monteiro MCM, et al (2007). Exposição múltiplaaagrotóxicos e efeitos à saúde: estudo transversal emamostra de 102 trabalhadoresrurais, Nova Friburgo, RJ. Ciênc. saúdecoletiva. 12 (1): 115-130.

Araujo JNG, Greggio MR, Pinheiro TMM (2013).Agrotóxicos: a sementeplantada no corpo e namente dos trabalhadoresrurais.Psicol. rev. (Belo Horizonte). 19 (3): 389-406.

Brasil (2016). Ministério da Saúde. Resolução nº 510, de 07 de abril de 2016. Que trata das especificidadeséticas das pesquisasnasciênciashumanas e sociais e de outras que utilizammetodologiaspróprias dessas áreas. DiárioOficial da RepúblicaFederativa do Brasil, Brasília (DF) [Internet]. seção 1:44-6. Disponívelem: https://www.scielosp.org/article/csc/2016.v21n8/2619-2629/

Brasil, Decreto n.° 4074 de 04 de janeiro de 2002. Regulamenta a Lei n.° 7802/89 (Lei Federal dos agrotóxicos) [Internet]. Brasília, DiárioOficial da União de 8 de Jan 2002. Disponívelem: http://www2.camara.leg.br/legin/fed/decret/2002/decreto-4074-8-janeiro-2002-431437-norma-pe.html.

Campos Y, Santos VPS, Sarpa MCM, Barros UO (2016). Exposure to pesticides ande mental disorderes in a rural population of Southern Brazil. Neurotoxicology. 56: 7-16.

Carneiro FF, Augusto LGS, Rigotto MR, Friedrich K, Búrigo AC (2015). Dossiê ABRASCO – Um alertasobreosimpactos dos agrotóxicosnasaúde. Parte 1 - Agrotóxicos, SegurançaAlimentar e Nutricional e Saúde. [Internet] Rio de Janeiro: EPSVJ; São Paulo: Expressão Popular. Disponívelem: https://www.abrasco.org.br/dossieagrotoxicos/wp-content/uploads/2013/10/Dossie Abrasco_2015_web.pdf.

Cassal VB, Azevedo LF, Ferreira RP, Silva DG, Simão RS (2014). Agrotóxicos: umarevisão de suasconsequências para saúdepública. Rev. Eletr. Gestão, Edu. Tecn. Digital.8(1): 437-445.

Cavalcante CAA, Santos RS, Cavalcante EFO, Martins RL, Silveira EA, Silva ET (2014). Perfil dos agravos relacionadosaotrabalhonotificados no Rio Grande do Norte, 2007 a 2009. Epidemiol. Serv. Saúde. 23(4): 741-752.

Cezar-Vaz MR, Bonow CA, Mello MCVA, Silva MRS (2016). Abordagemsocioambientalnaenfermagem: focalizando o trabalho rural e uso de agrotóxicos. Rev. Bras. Enferm. 69 (6): 1179-1187.

Faria NMX, Facchini LA, Fassa ACG, Tomasi E (1999). Estudo transversal sobresaúde mental de agricultores da Serra Gaúcha (Brasil). Rev. SaúdePública. 33(4): 391-400.

Faria NMX, Rosa JAR, Facchini LA (2009). Intoxicações por agrotóxicos entre trabalhadoresrurais de fruticultura, Bento Gonçalves, RS. Rev. SaúdePública. 43 (2): 335-344.

Faria NMX, Victora CG, Meneghel SN, Carvalho LA, Falk JW (2006). Suicide rates in the State of Rio Grande do Sul, Brazil: association with socioeconomic, cultural, and agricultural factors. Cad. SaúdePública. 22 (12): 2611-2621.

Hoshino ACH, Pacheco-Ferreira H, Taguchi CK, Tomita S, Miranda MF (2008). Estudo da ototoxicidadeemtrabalhadoresexpostosaorganofosforados. Rev. Bras. Otorrinolaringol. 74 (6): 912-918.

Levigard YE, Rozemberg B (2004). Ainterpretação dos profissionais de saúdeacerca das queixas de "nervos" no meio rural: umaaproximaçãoaoproblema das intoxicações por agrotóxicos. Cad. SaúdePública. 20 (6): 1515-1524.

Malaspina FG, Zinilise ML, Bueno PC (2011). Perfilepidemiológico das intoxicações por agrotóxicos no Brasil, no período de 1995 a 2010. Cad. Saúde Colet. 19 (4): 425-434.

Mazon LM, Steff CP (2012). Estudoepidemiológico dos fatores de risco para intoxicação entre fumicultoresexpostosocupacionalmenteaagrotóxicos. Rev. Saúde e MeioAmb. 1 (1): 65-73.

Meyer A, Koifman S, Koifman RS, Moreira JC, Rezende JC, Abreu-Vilaca Y (2010). Mood disorders hospitalizations, suicide attempts, and suicide mortality among agricultural workers and residents in an area with intensive use of pesticides in Brazil. J. Toxicol. Environ. Health A. 73(13-14): 866-877.

Moher D, Liberati A, Tetzlaff J, Altman DG (2009). PRISMA Group. Preferred reporting items or systematic reviews and meta-analyses: the PRISMA statement. Annals Internal Medicine. 151 (4): 264-269.

Neves PDM, Bellini M (2013). Intoxicações por agrotóxicosnamesorregiãonorte central paranaense, Brasil - 2002 a 2011. Ciênc. saúdecoletiva. 18(11): 3147-3156.

Pancotto L (2013). Presença de transtornosmentaiscomuns e do uso de agrotóxicos no município de Monte Belo do Sul – RS:um estudoexploratório. [monografia] [Internet]. Porto Alegre: Universidade Federal do Rio Grande do Sul, Faculdade de Medicina. 51p. Disponívelem: http://www.lume.ufrgs.br/bitstream/handle/10183/78462/000899733.pdf?sequence=1.

Peres F, Moreira JC (2007). Saúde e ambienteemsuarelação com o consumo de agrotóxicosem um póloagrícola do Estado do Rio de Janeiro, Brasil. Cad. SaúdePública. 23(Suppl 4): S612-S621.

Rebelo FM, Caldas ED, Heliodoro VO, Rebelo RM (2011). Intoxicação por agrotóxicos no Distrito Federal, Brasil, de 2004 a 2007 - análise da notificaçãoao Centro de

Informação e AssistênciaToxicológica. Ciênc. saúdecoletiva. 16(8): 3493-3502.

Silva EF, Paniz VMV, Laste G, Torres ILS (2013). Prevalência de morbidades e sintomasemidosos: um estudocomparativo entre zonas rural e urbana. Ciênc. saúdecoletiva. 18(4): 1029-1040.

Siqueira DF, Moura RM, Laurentino GEC, Silva GPF, Soares LDA, Lima BRDA (2013). Qualidade de vida de trabalhadoresrurais e agrotóxicos: umarevisãosistemática. Rev. Bras. Ciên. Saúde. 16 (2): 259- 266.

Siqueira SL, Kruse MHL (2008). Agrotóxicos e saúdehumana: contribuição dos profissionais do campo da saúde. Rev. esc. enferm. USP. 42 (3): 584-590.

Souza A, Medeiros AR, Souza AC, Wink M, Siqueira IR, Ferreira MBC, et al (2011). Avaliação do impacto da exposiçãoaagrotóxicossobre a saúde de população rural: Vale do Taquari (RS, Brasil). Ciênc. saúdecoletiva. 16 (8): 3519-3528.

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