Socio-environmental Health in primary care: knowledge, training and practice

Saúde Socioambiental na Atenção Básica: conhecimento, formação e prática

Jeffer Castelo Branco[1], Nildo Alves Batista[1], Silvia Maria Tagé Thomaz[1]

DOI: 10.1590/0103-11042022134101

ABSTRACT Human exposure to harmful chemical substances and compounds is a global reality that makes health promotion increasingly necessary for the people and communities exposed in their area. Considering that socio-environmental health observes the movement of pollutants at the environment-health-society interface, an attempt was made to analyze the knowledge, training, and practice of primary care teams in relation to socio-environmental health, focusing on the reduction of diseases due to exposure and poisoning by these substances. A Likert-type scale without a central point was used, validated by a group of 11 specialists and 3 primary care professionals. Minimal dispersion was ensured by the application of the survey and the calculation of Pearson's linear correction coefficient and reliability was assessed by the Spearman-Brown's reliability coefficient, using the split-half method. The survey showed that the knowledge dimension was generally classified as in a safe situation, the training dimension as in a danger situation, and the practical dimension as in an alert situation. Training was the only dimension that required immediate change in the overall results. Although the knowledge and professional practice dimensions were in a situation of maintenance and improvement, respectively, they are not acquired in formal educational institutions.

KEYWORDS Environment. Environmental exposure. Primary Health Care. Hazardous substances.

RESUMO *A exposição humana às substâncias e aos compostos químicos nocivos é uma realidade global que torna cada vez mais necessária a promoção da saúde às pessoas e comunidades expostas em seus territórios. Considerando que a Saúde Socioambiental observa o movimento dos agentes nocivos na interface ambiente-saúde-sociedade, buscou-se analisar o conhecimento, a formação e a prática das equipes da Atenção Básica com relação à Saúde Socioambiental, com foco na redução do adoecimento devido à exposição e à intoxicação por esses agentes. Utilizou-se a escala do tipo Likert sem ponto central validada por um grupo de 11 especialistas e 3 profissionais da Atenção Básica. Garantiu-se a existência de mínima dispersão com a administração do estudo e o cálculo do coeficiente de correção linear de Pearson; e boa confiabilidade por meio do teste de coeficiente de confiabilidade de Spearman-Brown, em que foi usado o Split-Half Method. A pesquisa revelou haver situação de conforto na dimensão conhecimento, perigo na dimensão formação, e atenção na dimensão prática. A formação é a única dimensão que, no resultado geral, demanda mudanças imediatas. Ainda que as dimensões conhecimento e prática profissional se apresentem, respectivamente, em situação de manutenção e aprimoramento, essas não se originam de instituições formais de ensino.*

PALAVRAS-CHAVE *Meio ambiente. Exposição ambiental. Atenção Primária à Saúde. Substâncias perigosas.*

[1]Universidade Federal de São Paulo (Unifesp) – São Paulo (SP), Brasil.
jcbranco@unifesp.br

Introduction

Socio-environmental health (SEH) is expressed through the interplay of environmental, social and economic aspects, highlighting relationships and conditions between environment, health and society that are crucial to the health-disease process. In this sense, the environment is understood as an important social determinant in this process, affecting people and populations under inappropriate conditions. Through educational, preventive, curative, and social care processes, approaches to comprehensive care, including SEH, are sought from the perspective of their promotion[1,2].

Chemical substances and their natural compounds can produce adverse environmental conditions and affect the plant, animal, and mineral kingdoms and be harmful to humans. Similarly, several substances synthesized by humans for a wide variety of purposes can be harmful and contained in food, hygiene, cleaning, clothing, and pharmaceutical products, which can be widespread and globally present in areas with equally harmful contaminants for humans[3].

In this work, attention was given to human exposure to harmful chemical substances and compounds, such as pollution in contaminated areas or the use and consumption of products and foods with high levels of hazardous substances. The study aims to provide an ecosystemic understanding that takes into account the environmental-health-society[4] triad, particularly in primary care.

SEH is an eminently interdisciplinary field that requires the integration of different fields of knowledge to be understood. Likewise, SEH is a field of interprofessional thinking and action, as it requires the attention of different professional groups, especially health professionals. The full spectrum of exposure and movement of hazardous chemicals in the environment, animal, and human organisms, as well as the movement of people and populations once affected, also require an interdisciplinary and interprofessional approach. Radicchi and Lemos state that[5(77)]:

> There is also agreement on the need to overcome the monodisciplinary paradigms in dealing with the environmental issue by systematically striving for interdisciplinary attitudes that actually mean interaction and exchange, socialization of languages, concepts, methods and visions between the social and human sciences and the natural and life sciences, and that must take as a starting point the search for coherent common philosophical references and categories.

Progress in this area dates back to the creation of the United Nations (UN) in 1945, with advances in the field of human rights, deepened by the creation of the World Health Organization (WHO) in 1948 and the United Nations Environment Programme (UNEP), in 1972. Further progress was the holding of international conferences that formulated international conventions and treaties, and the creation of participatory bodies with an executive mandate to address chemical issues, such as the Intergovernmental Forum on Chemical Safety (IFCS) and the Strategic Approach to International Chemicals Management (SAICM).

These spaces and legal instruments, among other environmental and health issues, aim to control more than 160 million chemical products, of which about 40,000 to 60,000 occur in world trade. This control is necessary because the WHO estimates that 24% of deaths are due to environmental risks[6].

The WHO also shows that each year about 7 million premature deaths from stroke, ischemic heart disease, chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections can be attributed to the combined effects of air pollution

(outdoors) and indoor air (in homes). The harmful elements of pollution are the free or adsorbed chemical substances in particulate matter.

Despite these advances in control, environmental issues are not usually part of the curriculum in basic education, but are usually introduced as a transverse topic[7] and in undergraduate courses, most of which have a strong disciplinary focus[8]. This may be related to the inadequate coverage of the complex health-environment issue, particularly with respect to human exposure to harmful chemical agents that are present daily in a wide variety of settings and environments.

The General Coordination for Environmental Health Monitoring (Coordenação Geral de Vigilância em Saúde Ambiental, CGVAM), established in 1999 under the National Foundation for Health (FUNASA) and led since 2004 by the Secretariat for Health Surveillance (SVS), and the General Coordination for Workers' Health (Coordenação Geral de Saúde do Trabalhador, CGST) of the Ministry of Health have developed various related activities in the field of environmental health, resulting in the first National Conference for Environmental Health in 2009. Based on this experience, we intend to deepen the studies to improve care for people and populations affected by exposure and poisoning from chemical substances and compounds.

Both at national and international level, important policies have been developed for the care of diseases of environmental origin. Eighty percent of health problems are solved in primary care, in direct contact with the territory and the environment[9].

However, there are still no effective measures to reduce and eliminate human exposure to harmful chemicals and compounds in these territories, nor are there measure to reduce the many different forms of contact. Similarly, there's a lack of specific procedures to diagnose and treat the health effects, as well as the necessary social care for affected people and populations. It is believed that more complex and effective environmental and social surveillance measures are needed to promote a paradigm shift in human exposure to chemicals.

Although there is a Poison Control Center in the region of this study, Baixada Santista, in the state of São Paulo, it focuses on the telephone service that educates the population and assists health professionals in providing first aid by prescribing the appropriate therapeutic treatment for each type of toxic substance[10].

Primary Care (PC), with its expected relationship of bonding, approaching, supporting, and listening to users, and interprofessional practice and Family Health Strategy can play a unique role in the socio-environmental and psychosocial dynamics of communities, with an approach in skilled comprehensive health, especially with regard to chemical safety in person-centered practice with an eye toward health promotion.

Based on these findings and the accumulated knowledge of the effects of exposure to chemical agents that are detrimental to human health, it is considered that practical public health measures can be improved from the perspective of SEH in the territories, as part of a health surveillance that aims more ostensibly to control, reduce, and eliminate diseases due to these causes. Radicchi and Lemos[5(74)] remind us that:

> The performance of the health sector in the environment depends on intra- and intersectoral actions based on knowledge of the subject, which is by no means easy, more so because of the interdisciplinarity required to characterize it. We must also not forget that the health sector, especially the Family Health team, plays a very important role in identifying these risk situations through its direct action in the region, in order to promote this intra- and intersectoral action with the aim of

eliminating or reducing the highlighted risks, thus promoting health and preventing disease in the populations directly or indirectly related to perceived environmental stresses.

The purpose of this article was to analyze the knowledge, training, and practice of PC teams regarding SEH, with a focus on reducing illness due to exposure and poisoning from harmful chemical substances and compounds. It is hypothesized that PC professionals do not have formal and systematic knowledge about SEH and have not received specific training on this topic. As a result, the attention to SEH in practice is not done effectively with regard to the objectives of health promotion in SUS.

Methodology

The study was an exploratory and descriptive investigation using qualitative and quantitative approaches. It was conducted jointly with PC and the Family Health Strategy (ESF) of the municipalities of Santos, São Vicente, and Cubatão, which together represent 50% of the metropolitan area of Baixada Santista, SP (a region that includes nine municipalities and has a total population of 1,865,397 inhabitants)[11].

In the three municipalities, 86 PC units, including 3 for specialized dental services, were visited at 79 sites, attended by 869 professionals (44.04% of the informed staff). Of these, 42.58% were health professionals, 29.80% were technicians, and 27.62% were college-educated professionals[12].

The study aimed to understand what knowledge PC professionals have about SEH by considering the aspects of exposure and chemical poisoning in their area (environment, products, food). It addressed topics such as: sources, routes and points of exposure, contact and routes of penetration, chronic intoxication and the chronicity of intoxications, pathologies resulting from exposure, impact of social and economic damage triggered by the intoxication process, and access and knowledge of the content of international conventions on the subject.

The study also examined how this knowledge is applied in professional practice, as well as the existence of specific policies and procedures to act on demand in cases of harm and illness caused by exposure to substances, compounds, and chemicals, the technical and professional difficulties in identifying and referring suspected cases, the disease process of users in terms of its origin in their professional activity, and knowledge and access to the diagnostic and surveillance network for vulnerable populations exposed to chemical substances.

Finally, the technical and professional availability to identify and refer suspected or confirmed cases, the implementation of spatial and temporal history in the process of specific case follow-up, and the real possibilities of collaboration between professionals were studied.

In order to address the target group, a Likert-type scale was used as a psychometric measurement tool. For the elaboration and application of this scale, as well as for the data analysis, the organizational chart of Pasquali[13] was used, which provides for three procedures: Theoretical, Experimental, and Analytical.

The scale was elaborated with four alternatives that have no neutral point (e.g., I don't know). The absence of the neutral point was chosen to avoid the 'central tendency bias', i.e., when respondents choose an uncontroversial intermediate option out of fatigue or to avoid committing to an opinion[14]. This option ensured greater internal consistency of the scale as well as its stability and validity[15].

Systematization of the theoretical basis and research objectives led to the identification of three dimensions: knowledge, training, and practice of PC professionals, where

the elaboration of the scale was based on the 12 criteria presented by Pasquali[15,16], namely: behavior, objectivity and desirability, simplicity, clarity, relevance, precision, scope, balance, variability, modality, typicality, and credibility.

In elaborating the statements, higher scores were assigned to responses that were consistent with professionals' best knowledge, training, and practice regarding SEH[17]. The scale was validated by a group of 11 experts composed of professionals with recognized knowledge in the field: two with postdoctoral degrees, six with doctoral degrees, two with master's degrees, and one with college degree. Of this group, seven were university professors, four had degrees in medicine, two in engineering, one in law, and one in chemistry (with minors in history and geography).

The experts analyzed the 30 statements originally proposed and randomized in the scale and selected the options in terms of the 'dimension' to which they belonged, 'relevance', and 'clarity'. In the form, there was space at the end of each statement for justifications if the answers to the relevance and clarity items were inadequate or totally inadequate.

Statements with an agreement rate ≥70% were retained without adjustments, those with an index <70% were retained and the suggested adjustments made, and statements with an index <40% were deleted.

The experts made several contributions to the semantics of the statements, which significantly improved the clarity factor and thus the quality of the instrument. These contributions were also instrumental in the inclusion of another statement in the final scale. This new version was subjected to a semantic evaluation conducted by a three-member panel consisting of an expert, a technician, and a professional from one of the participating services, who submitted contributions that resulted in two words being replaced. The result was the final version of the scale (*table 1*).

Table 1. Final randomized version of the Likert-type scale

1K*	I know that socio-ecological health is an area of health that deals with the physical, psychological, and socioeconomic status of people who may become ill due to environmental, social, political, and economic causes.
2E*	During my 'education' I didn't receive enough content about the possible forms of exposure and the routes of penetration of harmful elements or chemical substances into the body (skin, mucosa, inhalation, ingestion).
3P*	Within the scope of my professional activity, I apply specific procedures to identify in the territories (home, school, work and leisure), the forms and routes of exposure to environmental chemicals (air, soil, water, plants and animals) in the areas (living, study, work and leisure).
4P	It is very important to improve health care for people whose living territory (home, school, work, and leisure) is highly polluted.
5K	People and communities are exposed daily to elements and chemicals present in the environment in which they live (in the air, soil, and drinking water; in food and products for personal use and consumption).
6P	In the course of my professional activity, I apply specific procedures to identify, in the territories, the disease processes due to exposure to chemical substances through the consumption of food or the use of chemical products.
7P	During the follow-up of the user suspected of having an environmentally caused disease, a life history is prepared, which is narrated by the user and attached to the medical record (narrative).

Table 1. (cont.)

8K	Illnesses due to exposure and/or direct contact with harmful substances and chemicals can cause social and economic harm to those affected and must be avoided.
9K	My perception is that the general population does not know how to assess whether the food or products sold pose a risk in terms of the presence of harmful chemical substances (fruits, vegetables, fish, paints, solvents, hygiene and cleaning products, etc.).
10P	I do not regularly access, for download or send information, the Monitoring System for Populations Exposed to Chemical Agents (SIMPEAQ) or a similar system.
11P	In the health network, there is a procedure for referring patients suspected of chemical poisoning of environmental origin.
12K	I don't know what diseases may be caused by exposure and/or contact with harmful chemical elements or substances contained in products and foods of daily use and consumption.
13E	I believe that there are major gaps in my education regarding diseases caused by the presence of chemical substances in foods and products of daily use.
14P	In the place where I do my work, there is a specific policy for the dissemination of knowledge and action on harm and diseases caused by contact with substances and chemicals.
15E	In the courses offered at my workplace, there is not enough content on diseases caused by environmental pollution.
16E	During my studies, I did not receive enough content on the diseases that can be caused by exposure and contact with elements and/or chemical substances.
17K	Chronic poisoning from exposure to toxic substances and chemicals can cause lifelong damage.
18P	I do not know of any referral procedures to the Health Network through which the patient can be cared for in a timely manner so that poisoning from agents or chemicals can be diagnosed or discarded.
19P	In the place where I do my work, during professional meetings or lectures, there are often discussions about possible emission sources and places of exposure and contact with chemical agents that can cause illness in people in the territories.
20P	In the unit where I work, there are no instructions on how to proceed with complaints about diseases suspected to be due to exposure to chemical substances (environment, food, products).
21K	I am familiar with the contents of the Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury, which serve to control certain hazardous chemicals.
22P	In the Family Health teams, problems related to illness due to environmental causes, such as exposure to toxic chemicals, are always discussed among professionals and, when necessary, with the entire team.
23K	I need more support to intervene in problems caused by the spread of pollutants and chemicals in the environment and in products and food for daily use and consumption.
24E	In the courses offered at my workplace, there's not enough content on diseases caused by exposure or contact with chemical substances in food and products of daily use.
25P	In the place where I do my work, there is no specialized material with specific information about diseases, social and economic harms caused by exposure to substances and chemicals for reference.
26P	When users or populations are followed up, there's no investigation of whether cases of illness are due to the users' work or occupational activities.
27E	I feel that there are major gaps in my education regarding the causation of disease from chemical exposures in environmental pollution.
28P	In the place where I do my work, topics about the damage and diseases caused by contact with working materials and chemicals are often raised in professional meetings or lectures.
29E	During my 'education' I didn't receive enough content about everyday household products that may contain chemical substances in amounts that are harmful to human health.

Table 1. (cont.)

30P	In my professional activity, I find it difficult to verify whether the complaints reported by users are due to exposure to chemical substances (environment, food, products).
31E	During my 'training' I didn't learn enough about the sources and possible locations of exposure to harmful chemicals or elements.

Source: Elaborated by the author.

*Knowledge (K), Education (E), Practice (P).

The instrument was made available to all PC professionals, aiming to reach at least 100 subjects per factor or dimension or 10 subjects for each item of the instrument, for a total of 310 participants[13]. Data collection began in July and ended in November 2019 directly at the Basic Health Units using printed forms that included 18 participant characterization questions and the 31 statements of the scale.

To ensure minimal dispersion of responses, the Pearson's linear correction coefficient was used, discarding statements that achieved a linear correction value of less than 0.30 at the first application and less than 0.20 at the second application.

The reliability of the scale was measured by the Spearman-Brown reliability coefficient using the split-half method because the instrument was used only once with the target group. Pearson's linear correction calculation was used to validate the statements, yielding a reliability coefficient of 88% (0.84 for agents, 0.90 for technicians, and 0.86 for graduates).

The average of the dimensions and of the individual statements were classified into three levels: 'danger' for statements with an average score between 1 and 1.99, indicating situations requiring immediate changes; 'alert' for statements with scores between 2 and 2.99, indicating need of improvement of the situation; and 'safe' for statements with scores between 3 and 4, indicating a situation requiring only maintenance.

The Kruskal-Wallis test was applied and, as support for this task, the software 'AS', which performs multiple comparisons and FWER (family-wise error rate) control: 0.05 by the Bonferroni method. Multiple comparisons with FWER control by the Bonferroni method avoided the probability of committing type I errors (rejection of the null hypothesis when it is true) or type II errors (acceptance of the null hypothesis when it is false).

For comparisons between the three groups, the Mann-Whitney test of the 'MTB' software was applied, a non-parametric test that tests the null hypothesis against the alternative and allows pairwise comparisons (agent/technician – agent/graduate – technician/graduate).

This work followed established ethical procedures and was submitted to the UNIFESP Ethics Council via the Brazil Platform and approved on 12/02/2019. It was also approved by the Health Departments of Santos, São Vicente, and Cubatão. All participants read and signed the free and informed consent form.

Results

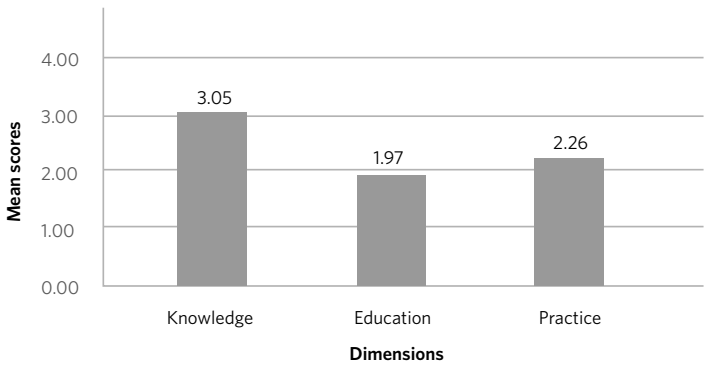
Responses were obtained from 869 PC professionals from the studied municipalities, which after analysis and elimination of problematic entries (deletions, duplicate responses, no responses) resulted in a total of 732 completed scales. Of these, 77% of the community health workers, 92% of the technicians, and 75% of the college graduates reported being female.

In terms of education, 43% of the agents and 70% of the technicians had higher education; of the graduates, 12% had a master's degree and 1% had a doctorate.

Of the agents, 62.70% reported having a technical level or higher, 17.84% reported having a basic or intermediate level, and 19.46% did not report. Of the technicians, 78.60% reported working in nursing, 19.84% in oral health, and 1.56% in pharmacy. Of the graduates, 19.67% reported working in medicine, 42.26% in nursing, 24.27% in dentistry, 2.93% in pharmacy, 1.67% in psychology, 1.26% in social work, 0.84% in nutrition, 0.84% in physical therapy, 0.84% in education, and 5.44% in other occupations.

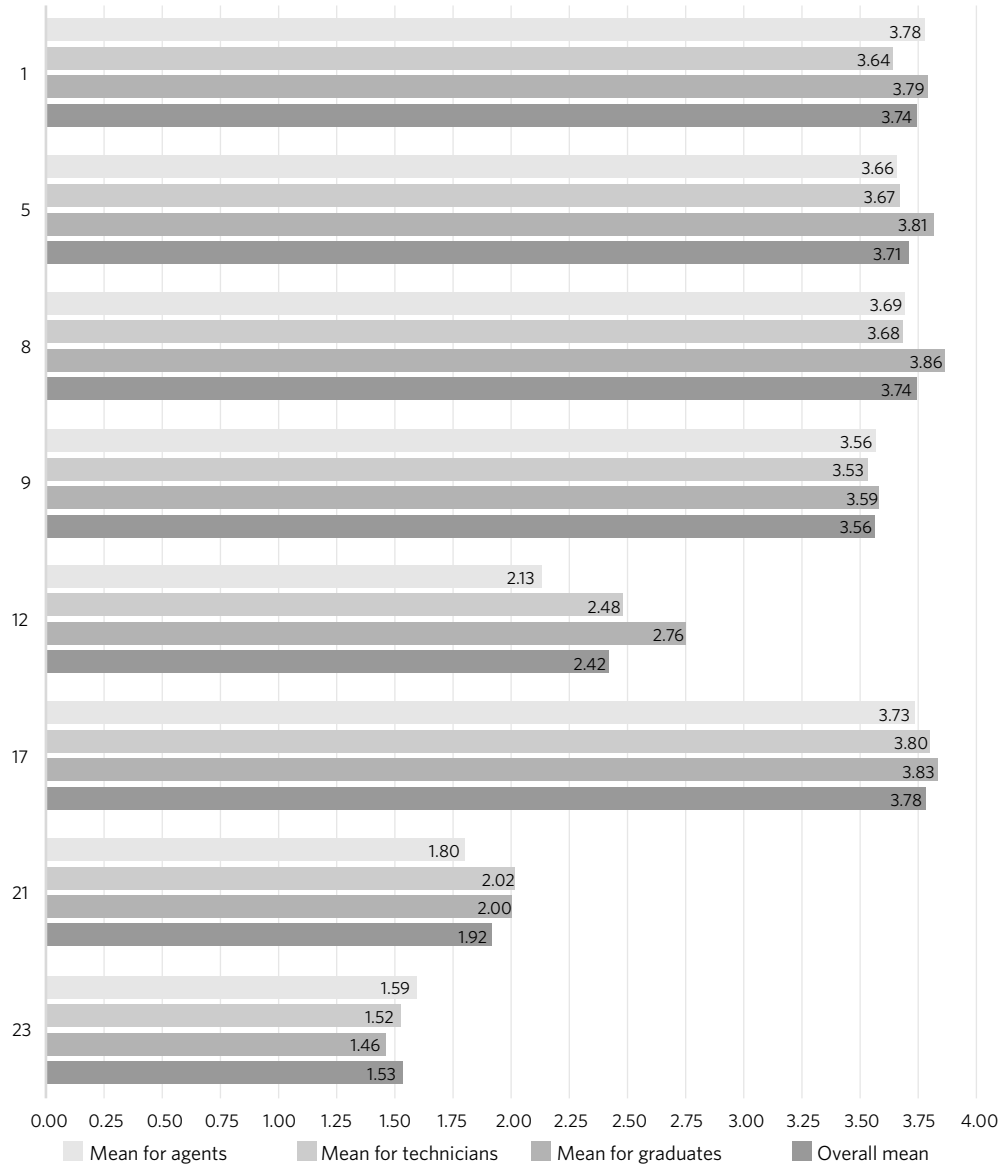
In the joint analysis of the 31 statements, the knowledge dimension was classified as a safe situation with an average of 3.05, the training dimension was classified as dangerous with an average of 1.97, and the practical dimension was classified as an alert situation, with an average of 2.26 (*graph 1*). In the joint analysis of the 31 statements, 19.35% were in a safe situation, 40.38% were in an alert situation, and 32.27% were in a danger situation.

Graph 1. General classification of dimensions – Municipalities: São Vicente, Santos, Cubatão. SP/Brazil



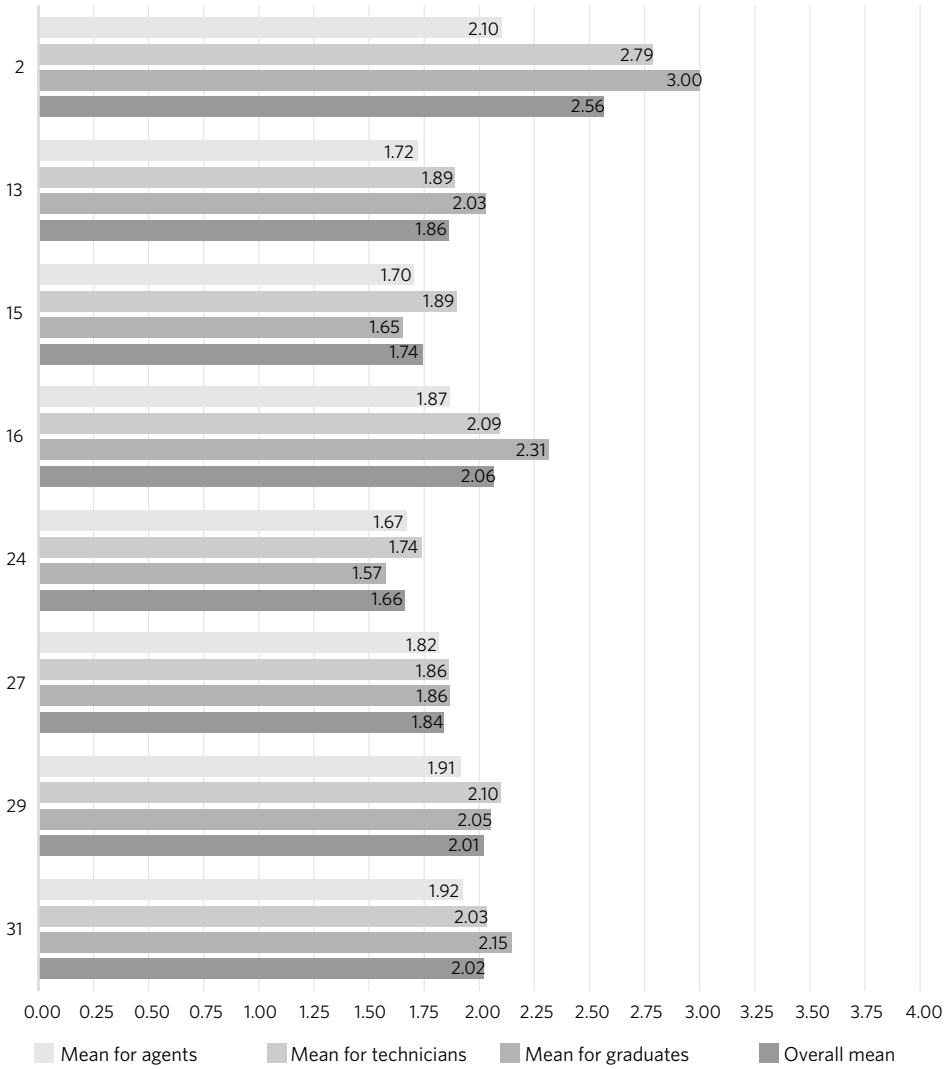
In a more detailed analysis by dimension, starting with knowledge, five statements were found to be in a safe situation with mean scores of 3.74, 3.71, 3.74, 3.56, and 3.78, one statement in an alert situation with a mean score of 2.42, and two statements in a danger situation with mean scores of 1.92 and 1.53 (*graph 2*). The Kruskal-Wallis hypothesis test was applied to account for the responses of the three groups of professionals. The test resulted in a chi-square of 4.9, two degrees of freedom, and a P-value of 0.08, which means that the differences between the medians were not statistically significant. The agents, technicians, and graduates agreed five times in a safe situation, once in an alert situation, and once in a danger situation; they disagreed only once in a danger situation, but with scores very close to the cutoff values.

Graph 2. General mean in the knowledge dimension



In the training dimension, which was classified as in danger, did not present any statement in safe situation, four in alert situation, with mean scores of 2.56, 2.06, 2.01, and 2.02, and four in a danger situation, with mean scores of 1.86, 1.74, 1.66, and 1.84 (*graph 3*). The Kruskal-Wallis hypothesis test, considering the responses of the three groups, yielded a chi-square of 70.39, two degrees of freedom, and a P value <0.001 suggesting that the differences in the medians between agents and technicians and agents and graduates were statistically significant.

Graph 3. General mean by groups of professionals in the training dimension

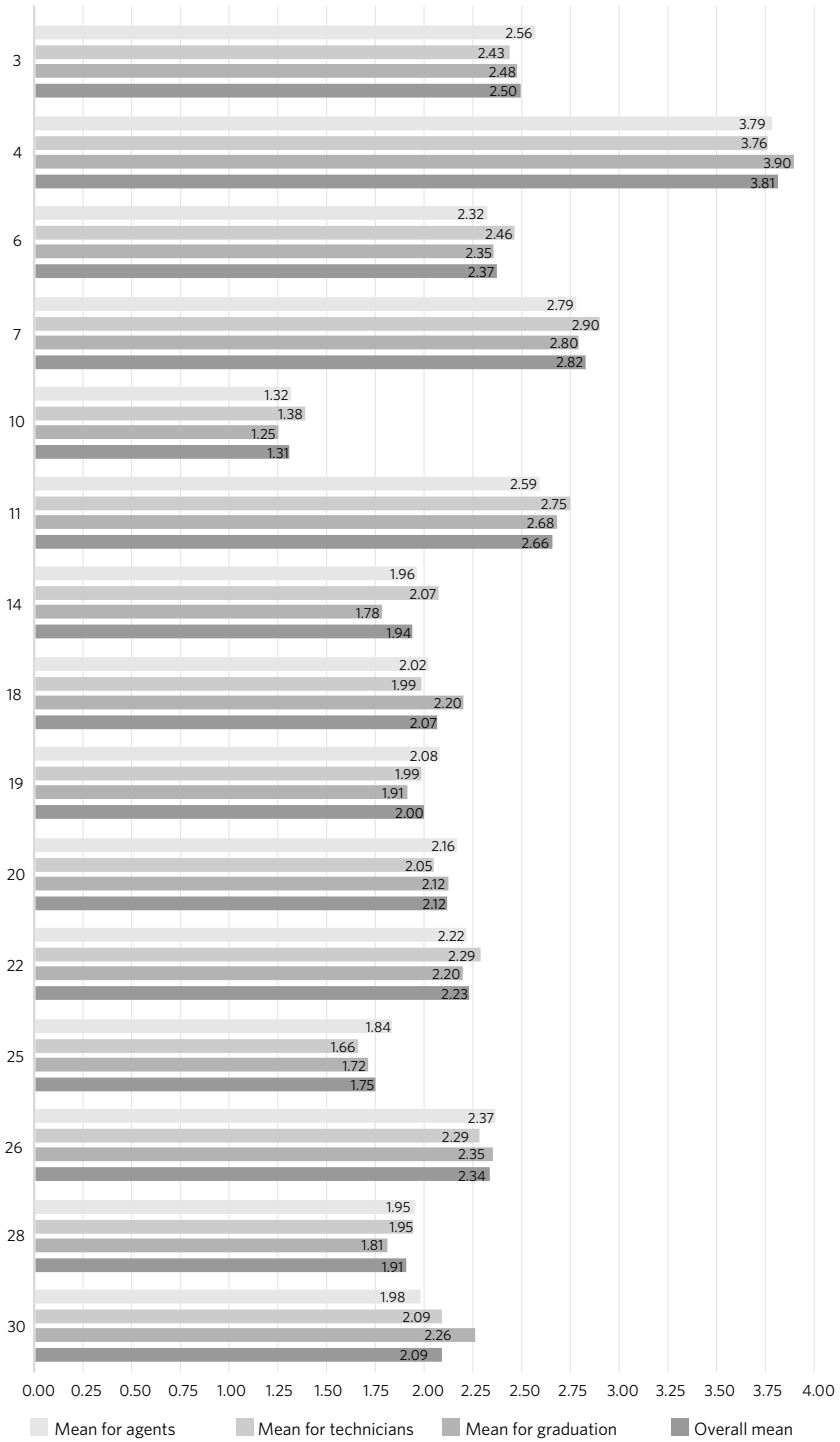


In the training dimension, agents, technicians, and graduates agreed only three times in a danger situation. The difference was a significant, indicating a low level of agreement between professionals, due to the high score of graduates compared to agents in certain statements, such as knowledge of diseases that can be caused by exposure, places and sources of exposure. This result may have been mitigated by the high percentage of graduates in the role of agents and technicians.

The analysis of the practical dimension, in a general situation of alert, presented one statement in a safe situation, with a score of 3.81, ten in alert, with average scores of 2.50, 2.37, 2.82, 2.66, 2.07, 2.00, 2.12, 2.23, 2.34, and 2.09, and four in danger, with average scores of 1.31, 1.94, 1.75, and 1.91 (*graph 4*). Using the Kruskal-Wallis hypothesis test, a chi-square of 7.64, two degrees of freedom, and a P-value of 0.021 were obtained, concluding that the differences between the medians were statistically significant between technicians

and graduates. In this dimension, the agents, technicians, and graduates agreed once in the safe situation, nine times in the alert situation, and twice in the danger situation.

Graph 4. General mean by groups of professionals in the practical dimension



Discussion

The Likert-type scale provided a good approximation with the subject by analyzing the dimensions together and by level of education, which, in dialog with the theoretical framework, allowed a better understanding of the phenomena.

The three professional levels of PC (agents, technicians, and graduates) knew that harmful chemical substances were present in a wide variety of environments as well as in products and foods, and that human contact with them could cause illness. However, they did not have a systematic knowledge of SEH and the diseases that can develop as a result of exposure and their exacerbation. They agreed that the population is exposed, but that people are not aware of this situation and do not know how to recognize the risks in order to avoid or reduce them.

The research also showed that professionals do not have access to and are not informed about the content of international conventions such as the Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury, whose objectives are to protect human health and the environment.

There are gaps in professional education about sites and sources of exposure to harmful chemical substances, as well as their routes of entry into the body and resulting diseases. This content and its interrelationships are not adequately taught in both initial and continuing education. This finding applies to participants in all levels of training (agents, technicians, and graduates).

The professionals also expressed that, despite the importance of paying more attention to the health of people in the territories, it is necessary to increase the frequency with which these issues are raised and discussed in professional meetings, as well as the frequency of publication of materials and the holding of lectures and the like. They also emphasized the need for a specific policy for the dissemination of knowledge in this area.

Among the various actions to be taken in the education and training of PC workers are training in the recognition and treatment of cases of poisoning, highlighting the need for prevention and identification of cases of chronic exposure, promoting changes in the curricula of the various fields, and promoting transdisciplinary training that integrates the fields of health, education, environment, and science.

It is clear that without reflection and complex action, without the connection of knowledge[18] and without interprofessional action[19], health promotion will not reach its full potential and chemical safety will not be effective in today's world.

In practice, professionals, regardless of their level of training, lacked skills to identify the forms and routes of exposure to environmental chemicals, as well as the consumption of food or the use of contaminated products or products with high levels of improperly tested substances and chemical compounds or hazards. There was a lack of procedures or protocols for medical cases suspected to be related to chemical exposures, making referral for diagnosis difficult. They also mentioned that there is a lack of records in users' medical files to obtain data to establish a user's life history and exposure history.

These data point to a greater engagement with SEH within the National Policy of Primary Care, expressed in the Regulation No. 2.436/2017[20] of Health Surveillance:

> [...] the person must be considered in his or her uniqueness and sociocultural environment to achieve comprehensive care that includes health surveillance measures – it constitutes a continuous and systematic process of collecting, consolidating, analyzing, and disseminating data on health-related events and aims to plan and implement public policies to protect the health of the population,

> prevent and control risks, injuries, and diseases, and promote health.

It is also important to reflect on the comments of Radicchi and Lemos[5] when they point out that

> the promotion of human health and cooperation in the protection of the environment, given the socio-ecological determinants, and in the prevention of injuries resulting from human exposure to harmful environmental agents, can also be achieved through a series of specific and integrated actions involving governmental and non-governmental organizations from civil society[5(30)].

Augusto[4] points out that in PC, the concept of territory should have a broader meaning than that limited to the organization of activities prescribed to the PC team, with established coverage criteria. Currently, the concept of territory even lacks the expected horizontality through the articulation of local social networks and which had little progress in its potential to fulfill the actions related to the promotion, protection, and care of health and prevention of risk situations in the environment in which people live and work.

In this sense, Rigotto et al.[21] point out the importance of interchange between the knowledge of the territories, through a necessary alliance of solidarity and trust between technicians, scientists working in universities, and non-governmental organizations (NGOs), with the population and social movements, in order to overcome the alleged superiority, objectivity, and neutrality of certain practices that promote a true epistemology of blindness.

To overcome this model, the author proposes effective societal participation in the creation of a national plan to combat the use of pesticides and their effects on health and the environment, and warns of toxicological challenges through the expansion of the network of reference laboratories, new exposure indicators, the assessment of multiple exposures, and the training and qualification of health care professionals.

Alonzo and Costa[22] point out that, without realizing it, we are exposed to substances, products and chemical contaminants (drugs, gasoline, pesticides). Therefore, it is necessary to formulate measures to implement practices that promote health, including prevention, recovery, rehabilitation, and monitoring. The authors also emphasize that these practices are integrated and continuous in the work process, but they are presented separately for didactic reasons. The authors underscore comprehensive care and suggest that a broader view and a common analysis of indicators that show the relationship between health and the environment are necessary for the discussion of environmental monitoring. They add that the data sources and sectors involved are still far from a model for this approach.

The results of this study are in line with the reflections of Augusto[4], Rigotto et al.[21] and Alonzo and Costa[22], who point out the need to strengthen health promotion in the expansion of surveillance, especially in PC, in order to achieve comprehensive health care that includes a more attentive and critical look at chemical substances and their preparation, which are widespread mainly as merchandise or as contaminants in a wide variety of products.

In this field, it is important to educate and train PC professionals so that they know how substances are obtained, used as products, or used as raw materials in a wide variety of processes that allow the synthesis of new products and chemical compounds, many of which are marketed without a full toxicological study. They also need to know where and how they enter the body (through inhalation, ingestion, or absorption through the skin), how they are distributed throughout the body and reach target organs, what are the symptoms, and how the disease

process develops. Finally, professional must be aware of what resources are available to people and populations for help, and how well prepared those resources are to provide the necessary assistance.

An important point in this process is monitoring by a team trained to collect data in the areas, enter them into the system and analyze them so that decisions can be made, mainly aimed at prevention and at finding effective environmental protection and health protection of people and populations.

Conclusions

The results of this research show that:

SEH needs professionals to look more closely at human exposure to harmful chemical substances and compounds.

There is a need for a broader, interdisciplinary, and interprofessional approach to the environment-health-society issue in relation to exposure and the process of chemical intoxication, in SEH care.

SEH education in PC, both initial and continuing, should prepare professionals for more attentive practice and more efficient and effective performance.

It is necessary to provide care and monitor suspected cases of exposure to harmful chemical agents in the areas.

In conclusion, this research pointed out the need to increase attention to chemical pollution in the territories, and proposed immediate changes to implement a more agile and operational system to inform and monitor the population in relation to chemical exposure and elaborate a permanent educational policy that takes into account these discussions, with case discussion sessions and the elaboration and availability of educational materials on SEH in PC's equipment.

The training and qualification of professionals for comprehensive health care that considers prevention and precaution for chemical safety must equally reach all PC workers (agents, technicians and graduates), and workers in secondary and tertiary care, providing access to high quality knowledge and explanations of the phenomena, the sources and how to treat intoxication, keeping an effective differentiated practice of the professional action in each of the training levels within the scope of its activities.

Collaborators

Castelo Branco J (0000-0003-1479-3745)*, Batista NA (0000-0002-5538-7447)* and Thomaz SMT (0000-0002-5766-1374)* contributed equally to all stages of manuscript elaboration. ■

*Orcid (Open Researcher and Contributor ID).

References

1. Ferretti N. Saúde socioambiental e conselho local de saúde: um estudo no âmbito da Estratégia Saúde da Família no município do Rio Grande/RS. [dissertação]. Rio Grande: Universidade Federal do Rio Grande; 2009. 122 p. [acesso em 2021 out 5]. Disponível em: http://repositorio.furg.br/bitstream/handle/1/2402/nadia%20ferretti.pdf?sequence=1.

2. Castelo Branco J. Convenção de Estocolmo Sobre Poluentes Orgânicos Persistentes: Impactos Ambientais, Sociais e Econômicos Associados. [dissertação]. Diadema: Universidade Federal de São Paulo; 2016. [acesso em 2021 out 6]. Disponível em: https://repositorio.unifesp.br/handle/11600/46547.

3. Organização Mundial da Saúde. Substâncias químicas perigosas à saúde e ao ambiente. Programa Internacional de Segurança Química. São Paulo: Cultura Acadêmica; 2008. [acesso em 2021 out 11]. Disponível em: https://www2.unesp.br/Home/costsa_ses/20110610_084213.PDF.

4. Augusto SGL. Inter-relações entre a Saúde Ambiental e Saúde do Trabalhador e a Atenção Básica de Saúde no SUS. In: Associação Brasileira de Saúde Coletiva. I Conferência Nacional de Saúde Ambiental. Rio de Janeiro: Abrasco; 2009. p. 105-108 [acesso em 2021 out 5]. Disponível em: http://www5.ensp.fiocruz.br/biblioteca/dados/txt_7832566.pdf.

5. Radicchi ALA, Lemos AF. Saúde Ambiental. Belo Horizonte: Coopmed; 2009. [acesso em 2020 jul 11]. Disponível em: https://www.nescon.medicina.ufmg.br/biblioteca/imagem/3913.pdf.

6. Organização Mundial da Saúde. Compendium of WHO and other UN guidance on health and environment. Geneva: WHO; 2022. [acesso em 2022 abr 11]. Disponível em: https://apps.who.int/iris/rest/bitstreams/1416445/retrieve.

7. Brasil. Ministério da Educação. Diretrizes Curriculares Nacionais da Educação Básica. Brasília, DF: Ministério da Educação; 2013. [acesso em 2021 out 10]. Disponível em: http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=13448-diretrizes-curiculares-nacionais-2013-pdf&Itemid=30192.

8. Pereira KAB, Bittar M, Grigoli JAG. Transversalidade e a interdisciplinaridade em educação ambiental: uma reflexão dentro da escola. Campo Grande: Universidade Católica Dom Bosco; [2007]. [acesso em 2021 out 5]. Disponível em: https://docplayer.com.br/storage/26/7731151/1657204111/y6A-3mzADgbc0IFeZYGaZyQ/7731151.pdf.

9. Campos RTO, Ferrer AL, Gama CAP, et al. Avaliação da qualidade do acesso na atenção primária de uma grande cidade brasileira na perspectiva dos usuários. Saúde debate. 2014 [acesso em 2020 jul 27]; 38(esp):252-64. Disponível em: https://www.scielo.br/pdf/sdeb/v38nspe/0103-1104-sdeb-38-spe0252.pdf.

10. Brasil. Ministério da Saúde. Disque-intoxicação. Anvisa. 2020. [acesso em 2021 fev 12]. Disponível em: https://www.gov.br/anvisa/pt-br/assuntos/agrotoxicos/disque-intoxicacao.

11. Brasil. Ministério da Economia. Cidades Cubatão, Santos, São Vicente - SP, 2010, 2017, 2019. Brasília, DF: IBGE; [s.d.]. [acesso em 2019 nov 17]. Disponível em: https://cidades.ibge.gov.br/.

12. Brasil. Ministério da Saúde. e-Gestor AB. Brasília, DF: Ministério da Saúde; [s.d.]. [acesso em 2021 nov 20]. Disponível em: https://egestorab.saude.gov.br/.

13. Pasquali L. Testes referentes a construto: teoria e modelo de construção. In: Pasquali L, organizador. Instrumentação psicológica: fundamentos e práticas. Porto Alegre: Artmed; 2010.

14. Achilleas Kostoulas. Applied Linguistics & Language Teacher Education. How to use Likert scales effectively. 2014 [acesso em 2020 jul 24]. Disponível em: https://achilleaskostoulas.

com/2014/02/03/designing-better-questionnaires--using-likert-scales/.

15. Pasquali L. Teoria e Métodos de Medida em Ciência do Comportamento. Laboratório de Pesquisa em Avaliação e Medida, Instituto de Psicologia. Brasília, DF: UnB; INEP; 1996.

16. Pasquali L. Princípios de Elaboração de Escalas. In: Gorenstein C, Wang Y-P, Hungerbühler I. Instrumentos de avaliação em saúde mental. Porto Alegre: Artmed; 2016.

17. Ritz MRC. Qualidade de vida no trabalho: construindo, medindo e validando uma pesquisa. [dissertação]. Campinas: Universidade Estadual de Campinas; 2000. 112 p. [acesso em 2020 maio 7]. Disponível em: https://core.ac.uk/download/pdf/296827867.pdf.

18. Morin E. Os sete saberes necessários à educação do futuro. 2. ed. São Paulo: Cortez; 2000.

19. Batista NA, Rossit RAS, Batista SHSS, et al. Educação Interprofissional na Formação em Saúde: a experiência da Universidade Federal de São Paulo, campus Baixada Santista, Santos, Brasil. Interface – Com. saúde educ. 2018 [acesso em 2020 dez 8]; (2):1705-15. Disponível em: https://doi.org/10.1590/1807-57622017.0693.

20. Brasil. Ministério da Saúde. Portaria nº 2.436, de 21 de setembro de 2017. Aprova a Política Nacional de Atenção Básica, estabelecendo a revisão de diretrizes para a organização da Atenção Básica, no âmbito do Sistema Único de Saúde (SUS). Diário Oficial da União. 22 Set 2017. [acesso em 2022 jul 15]. Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/gm/2017/prt2436_22_09_2017.html#:~:text=Aprova%20a%20Pol%C3%ADtica%20Nacional%20de,%C3%9Anico%20de%20Sa%C3%BAde%20(SUS).

21. Rigotto RM, Porto MFS, Folgado CAR, et al. Conhecimento científico e popular: Construindo a ecologia do saber. In: Carneiro FF, Augusto LGS, Rigotto RM, et al., organizadores. Dossiê ABRASCO: um alerta sobre os impactos dos agrotóxicos na saúde. São Paulo: Expressão Popular; 2015. p. 193-410.

22. Aguilar Alonzo HG, Costa AO. Bases da toxicologia ambiental e clínica para atenção à saúde: exposição e intoxicação por agrotóxicos. São Paulo: Hucitec; 2019.

Received on 11/01/2021
Approved on 04/23/2022
Conflict of interests: non-existent
Financial support: Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES) process no. 88882.430888/2019-01