Safety Science 61 (2014) 51–58

Contents lists available at SciVerse ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Chemical hazard communication comprehensibility in South Africa: Safety implications for the adoption of the globally harmonised system of classification and labelling of chemicals

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ARTICLE INFO

Article history:
Available online 6 August 2013

Keywords:
Hazard communication
Chemicals
Comprehensibility
Globally harmonised system
Safety data sheets
Labels

ABSTRACT

Chemical hazard communication is a key strategy to prevent illness and disability from exposures to potentially hazardous chemicals. The Globally Harmonised System of Classification and Labelling of Chemicals (GHS) was developed to strengthen national capacities for safe management of chemicals. In this paper we present the results of a descriptive study on comprehensibility of chemical hazard communication elements. The study of 402 respondents, including 315 workers in the manufacturing, transport and agricultural sectors and 87 consumers was conducted in 2003 to provide data on chemical hazard communication comprehensibility as part of a feasibility study into the possible adoption of the GHS in South Africa. Data were collected using an interviewer-administered instrument developed for the International Labour Office (ILO) to support GHS implementation.

Less than half of respondents reported any training in their current jobs in health and safety, and only 34% on labels. Agricultural workers were far less likely to have received any training. In general, comprehension of hazard communication labels and safety data sheets (SDSs) was low. Symbols such as the skull and crossbones (98%) and the flammable (93%) symbol were relatively well understood (either correct or partly correct responses), but the majority of hazard symbols were of moderate to poor comprehensibility (less than 75% correct or partly correct responses). Significant levels of critical confusions (5% or more) occurred with symbols for corrosive and compressed gas. Co-workers and supervisors were identified as important sources of information.

If the GHS is to provide a safety framework, there has to be investment in GHS training that emphasises comprehensibility. There should be a focus on those items causing critical confusion and peer trainers should be used. The GHS should be promoted through media to reach consumers. If the GHS fails to address problems of comprehensibility, it will only succeed in facilitating trade in chemicals without ensuing adequate safety.

1. Introduction

Chemical hazard communication, through the provision of labels and safety data sheets (SDSs), is a key strategy for the prevention of illness and disability due to unsafe use of, or from exposure to potentially hazardous chemicals (London and Rother, 2003). The intention is that hazard chemical communication tools will provide hazard information about the particular chemical for informed risk decision making, as well as promote scientifically determined cautionary behaviours required to prevent hazardous exposures (Rother and London, 2008; Weyman et al., 1998). Increasing international concern for chemical safety and the existence of too many varied chemical hazard communication systems has seen the development of a Globally Harmonised System of Classification and Labelling of Chemicals (GHS, 2005; Winder et al., 2005). This system not only endeavors to harmonise existing hazard classification and labelling of chemicals, it also attempts to strengthen and promote (especially in developing countries) national capacities for the management of chemicals in line with Chapter 19 of Agenda 21 (UNDES, 2004). This system is based on the intrinsic hazard of the chemical and not the risk (Silk, 2003). The GHS was approved by the United Nations Committee on Experts on the Transport of Dangerous Goods and the GHS (UNCETDG/GHS) in 2002 (GHS, 2005), and focuses on four main sectors – Transport, Industrial/Workplace, Consumer Products and Agriculture/Pesticides). The target implementation date was 2008 for this voluntary, non-legally binding treaty.

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http://dx.doi.org/10.1016/j.ssci.2013.07.013

No country is known to have fully implemented GSH until now (United States Department of Labour (ILO), 2012). Support initiatives have been introduced in a number of developing countries to implement the GSH (Ta et al., 2009). Ta et al. (2009) state that countries without existing legal requirements for the classification and labelling of chemicals can adopt the GSH criteria more rapidly than countries with existing related legislature. It should be noted that even with GSH adoption the classification of individual chemicals could differ in different countries (Miyagawa, 2010; Ta et al., 2009).

Critical to the success of the GHS is the question of comprehensibility of the GHS label and safety data sheet elements by the target populations in all four sectors, particularly in developing countries. Systems developed at international agency levels have to be tested at national and sub-national levels to ensure their meaningful effectiveness on the ground, and optimise their value for countries, consumers and working populations exposed to potentially hazardous chemicals. In light of this, the aim of the study was to assess how the elements of chemical labels in general and the proposed GHS specifically where understood by developing country workers in transport, manufacturing and agricultural sectors, and consumers. At the time of the study, the GSH had not yet been implemented in South Africa. Subsequently, in 2008 a GSH standard for use in local legislature (SA Bureau of Standards (SABS), 2008) was published and new legislation on classification and labelling of chemical substances incorporating GSH was drafted. This feasibility study contributed to the progress made in adopting GSH in South African legislature (London et al., 2003a,b). The draft legislature has not yet been promulgated into regulation under the South African Department of Labour because the US Occupational Health and Safety Act (OHSA) which is a reference for the South African legislation, is still under review and going through major changes. Also, the GHS text was found to be out of line with the SA constitution and so changes are being made in respect to this as well. South Africa established a National Committee on Chemical Safety in 2009 to oversee the monitoring and implementation of the GHS (2012 for substances and 2016 for mixtures). A rationale of the GHS is to harmonise and standardise safety data sheets (SDSs), which as the time of this study were of variable standards and quality in South Africa.

2. Methods

2.1. Subjects and study site

In 2003 a cross-sectional descriptive study of consumers and employees in industry, transport and agriculture, the four user sectors most affected by GHS implementation, was conducted in the Western Cape and Gauteng provinces of South Africa. It was not possible to select an equal number of subjects from the four sectors in the two provinces, because the different sectors are not equally represented in the two provinces. However, 200 subjects per province were targeted weighted according to the distribution of the workforce in each sector in each province. The final sample included 402 respondents, most (73%) from Cape Town and from the industrial sector (Table 1).

Table 1
Final sample realised in the study.

	Province 1	Province 2	Total
Chemical Industry	62	24	86
Industry other than chemical	63	27	90
Transport	44	28	72
Agriculture	55	12	67
Consumer	67	20	87
	291	111	402

Companies provided appropriate venues to interview workers, while consumers were interviewed in malls, or in venues provided by supermarkets and shops. Domestic workers were interviewed in private homes, as were employers of domestic workers.

Within the four sectors, subjects from different strata were selected. The industrial sector was stratified into a chemical stratum, which was over-sampled because it is an important user and generator of chemicals, and a non-chemical stratum which consisted of a combination of randomly selected Standard Industrial Classification (ILO, 1987) categories (mining, paper, textiles, electricity, gas and water, construction, and wholesale and retail trade) and then purposively selected categories thought to represent vulnerable populations with significant chemical exposure (health care, domestic works, and cleaning industries). The chemical and non-chemical strata were further categorised on company size (small = <20 employees, medium = 20–199 employees, large = >200 employees). Companies were selected from a sampling frame assembled from a multitude of sources including Chamber of Commerce lists, websites, telephone directories and membership of industry associations. If a company declined to participate, or did not respond, one substitution was allowed from the company next on the list. The transport sector was stratified by companies exclusively involved in transport versus companies in the manufacturing or other sectors who maintained substantial transport fleets (e.g. petroleum).

Co-operation was obtained in over 80% of employers. Where selected companies declined participation, or were not contactable, the next company on the sampling list was selected. Replacement was required in 5 of the chemical companies (42%), 9 of the non-chemical companies (45%) and 3 of the transport companies (23%). Appointments at participating companies were scheduled ahead of the field visit, at dates and times convenient to employees and employers. Companies were requested to facilitate interviews with appropriate categories of employees as outlined in a sampling frame.

The transport strata was also sub-divided based on company size and companies selected from a sampling frame generated in the same way as in the industrial sector. These included road, rail, air and sea workers (Table 1).

For agriculture, where the size of the operation is less important than the type of operation, the substrata included large commercial farming (including agribusiness), small commercial farming, emergent farmer and state-run farms. In addition, a stratum for pesticide retailers was used. Because of limitations in access, farms were selected by opportunistic sampling and subjects included managers and farm workers (Table 1).

Consumers were sampled by opportunistic sampling from supermarkets, laundromats, hairdressers and hardware shops, stratified by urban and rural consumers (Table 1).

2.2. Survey instrument

The Hazard Communication Comprehensibility Testing (CT) Tool survey instrument used in the study (Table 2) was an abbreviated version of the original instrument developed for the International Labour Ogranziation (ILO) by the Occupational and Environmental Health Research Unit of the University of Cape Town in 2000 (http://www.unitar.org/cwm/ghs_partnership/CT.htm). The adapted tool included 7 of the original 9 questionnaires appropriate for each of the 4 sectors. Each questionnaire represents a module which deals in detail with a specific hazard communication element found on the label or SDS – for example, symbols, signal words, colour, hazard statements and pictograms. A manual to accompany the modules was compiled as guide for