

# Assessment of Occupational Health and Safety in Khartoum Drinking Water Facilities

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**To cite this article:**

Hassan Ahmed Sulieman Abdelrahman. Assessment of Occupational Health and Safety in Khartoum Drinking Water Facilities. *Journal of Civil, Construction and Environmental Engineering*. Vol. 2, No. 1, 2017, pp. 12-16. doi: 10.11648/j.jccee.20170201.13

**Received:** January 4, 2017; **Accepted:** January 13, 2017; **Published:** February 9 2017

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**Abstract:** This paper aims to identify risks that are likely to affect workers and addressed the problems of work injuries in drinking water facilities, which leads to reduce performance, production and quality in drinking water treatment process. The study assumed that occupational health & safety system was executed in all Khartoum state drinking water facilities. Soba and Bahri stations have been visited, personal interviews with operational and administrative departments and then primary data pertaining to each stage of treatment was collected in both stations. Also a questionnaire developed for this study, distributed to the workers and analyzed using statistical techniques. The study concluded that some of risks in the Khartoum state drinking water facilities cause death, permanent disability and temporary disability. The study recommended that a program of occupational health and safety for all drinking water facilities in the Khartoum state must be developed, implemented and monitored.

**Keywords:** Drinking Water, Khartoum, Occupational Health and Safety, Risk

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## 1. Introduction

Health in general defined as complete physical, mental and social well-being [1], also it is social and personal resources as well as physical capabilities [2] and may be defined as the ability to reach goals, meet personal needs and cope with everyday life [3]. Occupational health has a multidisciplinary and comprehensive approach that considers the individual's physical, mental and social well-being [4]. Also, its mentioned that occupational health and safety is a multidisciplinary concept that relating to many and different disciplines such as medicine, law, technology, economics and psychology [5]. Occupational health and safety issues involving the physical space of work, types of occupation and their effect on health, job stress, work schedules, and other psychosocial issues in the work environment [6]. Psychosocial risks at work are still largely neglected and their causes & consequences still insufficiently understood especially in the developing country context [7]. Accordingly, all workers have the right to healthy and safe work and to a work environment that enables them to live in a socially and economically productive life [4]. Health and safety of all employees is closely linked to the organization's

productivity in all workplaces [8]. Reduction the rates of workplace injury and illness, reduction the social and economic costs of injury, improvement of work productivity without need to increase labor working hours and offering good working conditions to recruit and retain skilled labor are the main factors that links productivity and employee's [9]. Workers in industrial countries complain about psychological stress and overwork. These psychological factors have been found to be strongly associated with insomnia, depression, and burn-out syndromes, as well as cardiovascular diseases [10]. Occupational health & safety is at the center of sustainable development in several ways such as prevention of labor from occupational accidents, injuries & diseases to minimize the unnecessary loss of human and material resources; occupational health legislation requires the use of the best available protection technology; occupational health may facilitate to increase quality, productivity and process management; link between occupational health & environmental approaches; occupational health action to follow the principles of the Rio declaration with regard to healthy and productive life; initiation of a two way relationship between occupational health & safety and sound environment development; and align of personal well-being & socioeconomic development

of the community & countries with employment policy [11].

Results of studies carried out with informal workers show that occupational hazards are common in their work environment, such as chemical and poisons [12]; [13], excessive noise and dust [14], awkward postures [12]; [13], work overload [15]; [13], and poor sanitation [16]; [17] leaving them at increased risk of injuries or diseases. However, several independent community based studies carried out in distinct regions of Brazil, a country that have a large proportion of informal workers, consistently reported no differences between informal and formal workers with respect to mortality [18], incidence density rate for occupational-related accidents [19]. However, positive associations between informal jobs and mental disorders were estimated [17]. In other developing country, workers having informal jobs were more likely to report poor self-perceived health [20].

## 2. Materials & Methods

A comprehensive review of existing literature was previously carried out in order to identify the occupational health & measures to measure the gap between drinking water facilities in Khartoum state and standard measures. In order to test its convenience for use, a questionnaire form designed, administered through Soba and Bahri drinking water facilities in Khartoum State.

### 2.1. Design of the Questionnaire Form

The questionnaire form designed to meet the objectives of the study, namely to determine the occupational health & safety measures in drinking water facility and labor culture in this important area. A questionnaire survey was then

developed consisting of questions that inquire about the occupational health & safety dimensions that measure the main variables. Content validity tests cannot be tested by using statistical tools, and then an in-depth literature survey is necessary to keep the researcher's judgment on the right track [21]. An extensive literature survey was conducted to specify the variables that define the subject.

### 2.2. The Study Population and Sample

The study population consisted of all technical and administrative persons who are currently working in Soba & Bahri drinking water facilities in Khartoum State. A convenient sample of 47 workers in Soba and Bahri drinking water facilities was identified in a random selection process and the respondents were 47 workers which represent 100% of the total sample.

### 2.3. Data Collection Procedure

The questionnaire was administered through the Soba and Bahri drinking water facilities, this tool described the objectives of the study and asked the workers to participate in this study, then a forty seven questionnaire forms were completed on late year 2015, administered and analyzed by computer software (SPSS).

## 3. Results & Discussions

### 3.1. General Information

(a). Gender

It is shown from table 1 about 76.6% of questionnaire respondents are males and 23.4% females.

Table 1. Gender.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	36	76.6	76.6	76.6
	Female	11	23.4	23.4	100.0
	Total	47	100.0	100.0	

(b). Age

It is shown from table 2 about 40.4% of questionnaire respondents are at the level (36-45) years old, which represents the greater percentage than other age levels. Also 10.6% is age missing it may be representing the female culture of age closure.

Table 2. Age.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 - 35	15	31.9	35.7	35.7
	36 - 45	19	40.4	45.2	81.0
	46 - 55	6	12.8	14.3	95.2
	≥ 56	2	4.3	4.8	100.0
	Total	42	89.4	100.0	
Missing	System	5	10.6		
Total		47	100.0		

(c). Qualification

It is shown that from table 3, qualifications for workers equal in number as the basic and postgraduate studies have the same ratio (12.8%). Also secondary and graduate studies have the same proportion (36.2%), but they have a larger proportion of basic & postgraduate.

*Table 3. Qualification.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Basic	6	12.8	13.0	13.0
	Secondary	17	36.2	37.0	50.0
	Graduate	17	36.2	37.0	87.0
	Postgraduate	6	12.8	13.0	100.0
	Total	46	97.9	100.0	
Missing	System	1	2.1		
Total		47	100.0		

## (d). Occupation

It is shown from table 4, the engineers and technicians are the most numerous in the drinking water treatment plants with a rate of 57.4% for other professions.

*Table 4. Occupation.*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Administrative	6	12.8	12.8	12.8
	Engineer / technician	27	57.4	57.4	70.2
	operator	13	27.7	27.7	97.9
	Other	1	2.1	2.1	100.0
	Total	47	100.0	100.0	

**3.2. Basic Information**

## (a). Intakes

Table 5, show that reliability coefficient of answers of the sample are (64%). The truthfulness is (80%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the stud.

*Table 5. Reliability coefficient for water intake questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.642	18.4894	27.994	5.29098	7

## (b). Sedimentation basins

Table 6, show that reliability coefficient of answers of the sample is (52%). The truthfulness is (72%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 6. Reliability coefficient for sedimentation basins questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.401	7.5957	5.290	2.29990	3

## (c). Clarification ponds

Table 7, show that reliability coefficient of answers of the sample is (62%). The truthfulness is the square root of the ratio a (79%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 7. Reliability coefficient for clarification ponds questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.622	12.9362	13.887	3.72655	4

## (d). Sand filters

Table 8, show that reliability coefficient of answers of the sample is (65%). The truthfulness is (80%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 8. Reliability coefficient for sand filters questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.424	8.0000	7.652	2.76626	3

## (e). Chemistry Laboratory

Table 9, show that reliability coefficient of answers of the sample is (50%). The truthfulness is (71%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 9. Reliability coefficient for chemistry laboratory questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.462	10.2553	8.629	2.93752	4

## (f). Administrative responsibilities

Table 10, show that reliability coefficient of answers of the sample is (90%). The truthfulness is (95%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 10. Reliability coefficient for administrative responsibilities questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.902	17.4468	36.470	6.03903	5

## (g). Warehouses

Table 11, show that reliability coefficient of answers of the sample is (74%). The truthfulness is (86%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 11. Reliability coefficient for warehouses questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.742	12.5745	17.163	4.14280	4

## (h). Environment and general appearance of the station

Table 12, it is showed that reliability coefficient of answers of the sample is (57%). The truthfulness is (75%), which indicates that the identification of the study are characterized by a degree of stability is achieved the purpose of the study.

*Table 12. Shows the Reliability coefficient for facility environment questions.*

Cronbach's Alpha	Mean	Variance	Std. Deviation	No. of Items
0.565	13.8085	16.854	4.10534	5

These reliability values are satisfactory, since the Cronbach's alpha coefficients varies from 0.40 to 0.90 [22].

## 4. Conclusions & Recommendations

This paper concluded that the most expected risks may occur in Khartoum state drinking water facilities are risk of falling into water when labors are working in the intake of water facility, risk resulting from inhalation & exposure of chemicals added in clarification basins, risk of falling into the sedimentation basins, which are often large depths, risk of chlorine gas when inhaled in large quantities, risk of electric shocks, risk resulting from exposure to noise resulting from the drag pumps and pumping work, risk of burns and combustion, and risk of falling of fitting at heads as a result of improper storage. The paper recommended that the Khartoum drinking water facilities must take care to fire extinguishers of all kinds, diving dress in intake of the facilities, and signboards and guideline to facilitate movements. In addition to protective clothes, hand gloves, nose masks, sun glasses, and earphones protection.

## References

- [1] WHO (1986). Constitution: Basic documents, Geneva.
- [2] Nutbeam, D. (1990). Health Promotions Glossary, Health Promotion 1, pp. 113-127.
- [3] Raphael, D., Brown, I., Renwick, R. and Rootman, I. (1997). Quality of life: What are the implications for health promotion? American Journal of Health Behavior, 21, 118-128.
- [4] WHO (1994). Global strategy on occupational health for all: The way to health at work. Geneva.
- [5] Leka, S. (2003). Occupational health and safety practices in small and medium sized enterprises: A comparative study between England and Greece. Unpublished.
- [6] Warr, P. B. (1987). Work employment and mental health. Oxford University Press, UK.
- [7] WHO (2007). Raising Awareness of Stress at Work in Developing Countries Protecting Workers' Health Series No. 6, WHO Press, Geneva, Switzerland.
- [8] Oxenburgh M, Marlow P, Oxenburgh A. (2004). Increasing Productivity and Profitability through Health and Safety: The Financial Returns from a Safe Working Environment, (2<sup>nd</sup> edition), CRC Press, London.
- [9] Brandt-Rauf, P., W. N. Burton, and R. J. McCunney (2001). Health, Productivity, and Occupational Medicine, Journal of Occupational and Environmental Medicine, Vol. 43, No. (1), pp. 1-2.
- [10] Takele Tadesse and Mengesha Admassu (2006). Occupational Health and Safety, University of Gondar.
- [11] WHO (2001). Occupational health: A manual for primary health care workers, WHO regional office for the eastern Mediterranean, Cairo.
- [12] Lowenson, R. (1998). Health impact of occupational risk in the informal sector in Zimbabwe, International Journal of Occupational Health and Safety, 4, pp. 264-274.

- [13] Nilvarangkul, K., et al. (2006). Strengthening the self-care of women working in the informal sector: Local fabric weaving in Khon Kaen, Thailand (Phase 1), *Industrial Health*, vol. 44, No. 1, pp. 101–107.
- [14] Rongo, L., et al. (2004). Occupational exposure and health problems in small-scale industry workers in Dar es Salaam, Tanzania: A situation analysis, *Occupational Medicine*, 54, pp. 42–46.
- [15] Fonchigong, C. (2005). Negotiating livelihoods beyond Beijing: The burden of women food vendors in the informal economy in Cameroon, *International Social Science Journal*, vol. 57, No. 184, pp. 243–253.
- [16] Acho-Chi, C. (2002). The mobile street food service practice in the urban economy of Kumba, Cameroon, *Singapore Journal of Tropical Geography*, vol. 23, No. 2, pp. 131–142.
- [17] Da Silva, M., Fassa, A., & Kriebel, D. (2006). Minor psychological disorders among rag pickers workers: A cross-sectional study, *Environmental Health*, vol. 30, No. 5, pp. 1–10.
- [18] Nobre, L. (2007). Mortalidade por acidentes ocupacionais- precariedade do trabalho e a violen cia, Doctoral dissertation, Institute of Collective Health, Federal University of Bahia, Brazil.
- [19] Santana, V., & Loomis, D. (2004). Informal jobs and nonfatal occupational injuries, *Annals of Occupational Hygiene*, vol. 48, No. 2, pp. 147–157.
- [20] Dolinski, A., & Caputo, R. (2003). Health and female self-employment. *Journal of Small Business Management*, vol. 41, No. 3, pp. 233–241.
- [21] Dunn, S. C., Seaker, R. F., and Waller, M. A. (1994). “Latent variables in business logistics research: scale development and validation”. *Journal of Business Logistics*, 15 (2), 145-172.
- [22] Nunnally, J. (2010). "Psychometric theory". McGraw-Hill, New York, NY.