Research Article

2020; Issue 4
ISSN 2591 – 6769

East African Journal of Applied Health Monitoring and Evaluation

Ocular symptoms and associated factors among hairdressers in Kinondoni Municipality, Dar es Salaam, Tanzania

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INTRODUCTION
Hairdressers are exposed to chemicals from hair products such as hair dyes, glues, sprays, and relaxants, which increase risks for ocular diseases. There are limited studies assessing ocular diseases among hairdressers in Tanzania. The aim of this study was to estimate the prevalence of ocular symptoms and associated factors among hairdressers in Kinondoni Municipality, Dar es Salaam, Tanzania.

METHODS
This study employed an analytical cross-sectional study design. Data were collected from 300 hairdressers from 157 salons selected from ten wards of Kawe and Magomeni divisions of Kinondoni Municipality. Data on participants' sociodemographic characteristics, years of work experience, occupational activities, use of protective equipment, hazard awareness, training on chemicals use, types of hair products used, and self-reported ocular symptoms were gathered by using a structured questionnaire. Descriptive statistics, partial correlation and logistic regression were performed to understand the prevalence of ocular symptoms and association with other study variables.

RESULTS
The study enrolled a total of 300 participants who were primarily female (92%). The mean age (±SD) of the participants was 28 (±7) years. The prevalence of ocular symptom was 78.7%. The most prevalent symptoms reported were headache (68.7%) and itching (60.0%). There was a statistically significant association between years of work experience ($r = 0.314$, $p < 0.0001$), lack of training on chemical use [AOR = 0.0203 (0.01 - 0.054)], lack of hazard awareness [AOR = 0.05 (0.02 - 0.094)] and ocular symptoms.

CONCLUSION
Prevalence of ocular symptoms was high among the study participants. The variables associated with ocular symptoms were lack of training on chemical use, inadequate hazard awareness and years of work experience. The Occupational Health and Safety Authority (OSHA) of Tanzania should facilitate and conduct health promotion to hairdressers on protective measures and frequent breaks to reduce chemical exposure.

Keywords: Ocular symptoms; Ocular diseases; Hairdressers; Salons; Chemical

INTRODUCTION

The hairdressing occupation is associated with exposure to different kinds of health hazards such as chemical, biological, physical, psychological and ergonomic hazards. Chemical exposure includes hair products such as shampoos, permanent wave solutions, dyes, hair sprays, bleach, hair treatment and relaxants (Kim et al., 2016; Tsigonia, Lagoudi, Chandrinou & Linos, 2010). Exposure to these hazards may lead to health problems such as ocular diseases, occupational rhinitis, cancer, asthma, fertility problems and respiratory diseases (Ferreira, 2013; Johansson et al., 2014; Kim et al., 2016; Kumah et al., 2017).

There have been limited studies conducted in Africa assessing ocular diseases among hairdressers. A study in Ghana reported high prevalence (66.8%) of ocular symptoms among hairdressers; tearing was the most prevalent symptom

(89.1%), followed by eye redness (88.1%) and painful eyes (81.2%). The high prevalence of ocular symptoms was due to exposure of hairdressers to various chemicals that are potentially harmful to the eye and the visual system (Kumah et al., 2017). In Tanzania, a study assessing the occupational health hazards of cosmetologists (those who are doing treatment of skin, hairdressing and nail treatment), showed that workers suffered a number of health problems including musculoskeletal disorders, physical injuries, dermatitis, fungal infection, respiratory problems and infectious diseases (Bigambo, 2016). However, the study did not assess ocular diseases and symptoms. Another study in Tanzania assessed compliance to occupational and public health requirements among barber shops and hair salons (Nshunju, 2012). The study showed that workers who were knowledgeable about Occupational Health and Safety and Public Health requirements had higher compliance than those who had no such knowledge.

The Occupational Health and Safety (OHS) Act 2003 is the main legislation governing occupational health and safety practices in Tanzania, but it omits the self-employed and informal sectors like hairdressing (Mrema et al, 2015). Much of the legislation addresses safety issues such as lifting equipment and steam boilers. The legislation does not incorporate all working populations, as it provides OHS services to enterprises that can afford services. This leaves out informal sectors because of their low income (Mrema, et al., 2015).

Given the lack of data from Tanzania, we conducted a study to assess work-related ocular symptoms and associated factors among hairdressers in Kinondoni Municipal, Dar es Salaam. The findings from this study will enable policy makers to understand the extent of the problem and encourage them to review the existing policies in order to implement appropriate interventions to improve health and promote safety among this occupation.

METHOD

Study design and setting

This analytical cross-sectional study was conducted to estimate prevalence of ocular symptoms and related factors among hairdressers. The study was conducted in Kinondoni Municipality in Dar es Salaam region, Tanzania, which has a total area of 522.3 km^2 and a population of 1,775,049 (Tanzania Demographic Census 2012). The municipality has two divisions, Magomeni and Kawe, with eleven and nine wards, respectively, from which the study participants were recruited. The Kinondoni Municipality was selected for this study because it has a large number of hairdressing salons (304) compared to other districts.

Study subjects and sampling methodology

The study was conducted from April to June 2018. The method used for sample size estimation was probability sample size estimation developed by Fox, & Hunn, 2007. The sampling procedure was a multistage sampling from municipality to division to ward then to salon and finally to hairdresser. To account for the design effect, the sample size was multiplied by 1.5. The sampling frame of all 304 hairdressing salons with their contact information was obtained from the department of business in Kinondoni Municipality. Ten wards with a large number of hairdressing salons were selected: six wards from Magomeni Division and four wards from Kawe Division. Eighty-seven (87) and 70 hairdressing salons were randomly selected from Magomeni and Kawe divisions, respectively. To avoid recruiting hairdressers with a brief period of chemical exposure, the study was restricted to 319 participants who had worked as hairdressers for at least two years. Participation was voluntary. Hairdressers were informed about the purpose of the study and their consent was requested. In order to have a representative sample, two hairdressers were interviewed at each salon; all were between 18 and 47 years old.

Data collection tools and procedures

A face-to-face interview with hairdressers was conducted using a structured questionnaire that was pilot-tested in four hairdressing salons in Magomeni and Kawe Divisions. The pilot testing was done to check the validity of the questionnaire. The questionnaire gathered information on socio-demographic characteristics, work experience, occupational activities, use of personal protective equipment (PPE), hazard awareness, training on the use of chemicals, types of hair products used, reported ocular symptoms and health-seeking behaviour. The questionnaire was written in English and translated into Swahili. A checklist was used to record the working conditions in each hairdressing salon. These conditions include presence and type of ventilation (as per Tanzania Public Health Act 2009, which considers openings such as windows and air conditioners to be adequate for ventilation in salons) and the presence of PPE (the recommended equipment by Tanzania Occupational Health and Safety Act 2003, such as eye goggles for eye protection, gloves for protection of the hands and masks for protecting the nose). Prior to data collection, research assistants were trained and familiarized with the study objectives and the data collection tools. At each hairdressing salon, we conducted observation and interviewed a maximum of two hairdressers. Data collection was done on weekdays from morning to afternoon hours.

Data Analysis

Variables and measures

The dependent variable, ocular symptoms (i.e. blurry vision, headache, burning sensation, painful eye, discharge, tearing), were measured as categorical variables where 1 is the presence of any ocular symptom and 2 was the absence of symptoms. The prevalence was calculated by the formula developed by Bhopal, (2002). Prior to statistical analysis, the internal consistency of the variables used to obtain total scores on ocular symptoms was investigated by using Cronbach's alpha test. Results were 0.8 value for Cronbach's alpha, which is above the threshold of 0.7, suggesting one can proceed with the analysis since the variables are internally consistent (Pallant, 2003). For each participant, each ocular symptom reported was tallied to generate a total score, which was later used to provide a benchmark for

establishing a relationship between years of work experience and the symptoms in the correlation analysis. Each form of ocular symptom was scored as 1.

Independent variables included hazard awareness, training on the use of chemicals, the use of PPE, presence of adequate ventilation, and length of working experience in years. Potential confounders such as age, education, smoking, previous ocular disease, and conditions such as diabetes and hypertension were controlled for in the multiple logistic regression model.

Statistical analyses

The data was analyzed by using IBM Statistical Package for Social Sciences (SPSS) for Windows version 20 (IBM Corp., Armonk, New York, USA), applying both descriptive and inferential statistical approaches. Inferential statistical approaches applied were chi-square test, logistic regression and correlation test with p-values less than 0.05 considered statistically significant. Chi-square test was used to show the relationship between categorical variables (ocular symptoms) and independent variables (hazard awareness, training on the use of chemicals and the use of protective gears such as goggles). Logistic regression was used to determine factors which strongly affected the dependent variable while correcting for confounders (age, education, smoking, history of ocular diseases, diabetes and blood pressure). Correlation test was used to determine the relationship between numerical variables (total scores of ocular symptoms and length of work experience). Partial correlation was also used to correct for confounders.

Ethical Considerations

Ethical approval was obtained from Muhimbili University of Health and Allied Sciences (MUHAS) research and publication committee. The permission to conduct the study at the Kinondoni Municipality was obtained from the District Medical Officer (DMO) of Kinondoni Municipality. Participants were given written informed consent forms before consenting to participate. The study participants who were found to have ocular symptoms were advised to seek health care from the nearest health care facility.

RESULTS

Background characteristics of study participants

A total of 319 hairdressers were contacted, and 300 hairdressers from 157 salons participated in the study, resulting in a participation rate of 94%. The mean age was 28 ± 7 years, and most participants had received either primary (42.0%) or secondary (51.0%) education. Most study participants were non-smokers (99.3%), non-diabetic (92.0%), and 92.0% had normal blood pressure (**Table 1).**

Distribution of risk factors

A total of 220 respondents (73.3%) had received on-the-job training, but only 58 participants (19.3%) had their training in recognized vocational institutes. About 63% of the respondents were aware of hazards that they could encounter at their work place.

Table 1: Socio-demographic characteristics of hairdressers in Kinondoni Municipality (N = 300)

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
≤30	194	64.7
>30	106	35.3
Gender		
Male	24	8
Female	276	92
Level of education		
No formal education	13	4.3
Primary education	126	42
Secondary education	153	51
Higher education	8	2.7
Smoking status		
Smoker	1	0.3
Non smoker	298	99.3
Previous Smoker	1	0.3
Diabetic Status		
Diabetic	24	8
Non diabetic	276	92
Blood pressure status		17.5
High blood pressure	24	8
Normal blood pressure	276	92

Very few participants (8.3%) had training on the use of chemicals. Work experience for hairdressers differed among respondents; the minimum reported was two years and the maximum was 28 years. The mean number of working hours for hairdressers was 81 ± 4 hours per week. Air-conditioning was rarely used, and circulatory fans were used occasionally. Assessment of the availability and usage of protective devices showed that 60 respondents (20.0%) used gloves, 15 (5.0%) used goggles and 60 (20.0%) used nose devices **(Table 2).**

Ocular symptoms

The prevalence of ocular symptoms was 78.7%. About 64.3% (193 hairdressers) reported to have multiple symptoms. Headache was the most prevalent symptom reported (68.7%), followed by itching (60.0%). About 40% of participants complained about tearing and redness of eyes **(Table 3).**

Relationships between ocular symptoms and independent variables

This study shows statistical evidence of an association between prevalence of ocular symptoms and lack of hazard awareness; crude OR = 0.031 [0.039 - 0.172], adjusted OR = 0.05 [0.02 - 0.094]. The study revealed a statistically significant association between ocular symptoms and lack of training on chemical use; crude OR = 0.028 [0.014 - 0.059],

adjusted OR = 0.02 [0.01 - 0.054]. The study also showed a statistical association between ocular symptoms and non-use of eye protection; crude OR 0.117 [0.038 - 0.386] but not for the adjusted OR. A partial correlation test yielded a fair positive correlation ($r = 0.314$, $p < 0.0001$) between the ocular symptoms and years of work experience. However, there was no evidence of a statistically significant difference in prevalence of ocular symptoms among hairdressers who received vocational skills and those who did not **(Table 4).**

Table 2: Distribution of risk factors among hairdressers in Kinondoni Municipality (N = 300)

Risk factor	Frequency (n)	Percentage (%)
Job training		
Had job training	220	73.3
Had no job training	80	26.7
Place of training		
Vocational institutes	58	19.3
Non-vocational institutes	162	54
Hazard awareness		
Aware of hazards	189	63
Unaware of hazards	111	37
Chemical use training		
Trained on chemical use	25	8.3
Not trained on chemical use	275	91.7
Length of work experience		
1-5 years	167	55.7
6-10 years	90	30
11-15 years	21	7
16-20 years	18	6
> 20 years	4	1.3
Use of protective devises		
Used any protective devices	135	45
Did not use any protective devices	165	55
Types of protective devices used		
Gloves	60	20
Eye goggles	15	5
Nose devises	60	20
Type of ventilation (157 salons)		
Circulatory fans	98 salons	62.4
Air conditioning	3 salons	1.9

Table 3: Distribution of ocular symptoms reported by hairdressers in Kinondoni Municipality (N = 300)

Ocular symptoms	Frequency (n)	Percentages (%)
Multiple symptoms	193	64.3
Headache	206	68.7
Itching	180	60
Redness	121	40.3
Tearing	116	38.7
Painful eye	105	35
Foreign body sensation	90	30
Discharge	69	23
Blurry vision	51	17
Burning sensation	27	9
Swollen eyelids	26	8.7

Table 4: Determinants of ocular symptoms

Variable	Crude OR		Adjusted OR	
	OR (95%CI)	p-value	OR (95%CI)	p-value
Hazard awareness	0.031(0.039 - 0.172)	0.0001	0.05(0.02 - 0.094)	0.0001
Training on chemicals	0.028(0.014 - 0.059)	0.0001	0.02(0.01 - 0.054)	0.0001
Use of eye wear	0.117(0.038 - 0.386)	0.0001	1	0.969
Vocational skills	1	0.9007	-	-
Length of work	r = 0.455	0.0001	r = 0.314	0.0001

DISCUSSION

This study investigating ocular symptoms among hairdressers of Kinondoni Municipality found that the overall prevalence of ocular symptoms was 78.7%, with the most prevalent symptoms being headache (68.7%) and itching (60.0%). Symptoms were associated with lack of hazard awareness, lack of training on chemical use, and length of service.

The prevalence of ocular symptoms in our study was lower compared to those reported by Kumah, et al. (2016, 2017) and Omoti1(2008) from other occupations such as farming, mechanics and butchers. This difference may be due to differences in chemical use. However, the prevalence was higher compared to a similar study done by Kumah et al. (2017). A plausible explanation for higher prevalence in our study could be due to differences in age, sample size and in exposure time. Results from direct questioning revealed that hairdressers were working for an average of 81 ± 4 hours per week compared to 54.6 hours in the Kumah et al. (2017) study. The maximum length of working experience among

respondents was five years (10.4%) in Kumah et al. (2017) compared to our study (28 years), with 44% working more than six years. This shows that hairdressers in our study had longer exposure time to chemicals in hair products and heat from dryers and irons, which could account for the difference in ocular symptoms among them. The longer the exposure period the higher the exposure doses and hence health effects (Common Wealth, 2002).

Also, in the study of Kumah et al. (2017), 64 participants were above thirty years old compared to 106 participants in our study. It is believed that vision capacity decreases as one is aging (Varma, Vajaranant, Wu, & Torres, 2016). The higher prevalence of ocular symptoms in our study is also likely to be due to differences in environmental conditions of the selected salons. Most of the salons in our study had poor working/environmental conditions compared to those reported by Kumah et al. (2017), in which 93.5% of the hairdressing salons were tidy and well-ventilated. The higher prevalence may also be due to lack of training on the use of chemicals, lack of hazard awareness, non- use of eye protection, and longer working experience. Eye protection is important as it acts as a barrier between the eyes and contaminated air (Peate, 2007). Research suggests that eye protective devices, training of workers on handling chemicals, medical regular checkups and improvement of working environment might reduce chemical exposure (Abu et al., 2016; Kumah et al., 2017; Robinson et al, 2011).

Our study had several limitations. All variables were self-reported by participants, meaning that any variable could have been over-reported or under-reported. In addition, the hairdressers may have felt the need to underreport symptoms or deny having ocular problems because they liked their work. Finally, the data were collected in only two divisions of one municipality in Tanzania, and so the results may not be generalizable beyond this area or outside of Tanzania. These potential sources of bias could have affected our results either by underestimating or overestimating the true symptoms that hairdressers might have.

CONCLUSION

The study revealed a high prevalence of ocular symptoms among hairdressers in one municipality of Tanzania. Lack of hazard awareness, lack of training on the use of chemicals, and length of service were associated with ocular symptoms in this population. Hairdressers should work in adequately ventilated salons, use protective gear and have periodic eye and health check-ups to screen for ocular symptoms and other health effects. Future studies should build on these findings by assessing work factors associated with ocular symptoms and by measuring ocular diseases and their severity.

ACKNOWLEDGEMENT

We acknowledge Dr. Vera Ngowi, Mr. Alan Lwanga and Dr. Hussein Mwanga for their support towards accomplishment of this study. The authors are grateful for the financial support provided by NORAD through the NORHED-programme (Norwegian Programme for Capacity Development in Higher Education and Research for Development) via NORHED Project Tan:1300646-12 (North - South - South collaboration). We would also like to thank hairdressers of Kinondoni Municipality who spared their precious time to participate in our study.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

AUTHORS' CONTRIBUTIONS

OBT coordinated the study, designed the questionnaire, conducted field investigations and performed the statistical analysis and writing of the paper. She is the main author of the manuscript. EJM contributed to the formulation of the study, participated in data collection and writing of the manuscript. MS contributed to the inception of the study, data analysis and writing of the paper. All authors read and approved the final manuscript

REFERENCES

Commonwealth of Australia 2002. Environmental Risk Assessment: Guidelines for assessing human health risks from environmental hazards. Australia: Health Council. Retrieved from http://www.health.gov.au/pubhlth/strateg/envhlth/risk/pdf.

Abu, E. K., Bert, S., Kusi, B., Opuni, P. Q., Kyei, S., Ansah, A. O., et al. (2016). Ocular Health and Safety Assessment among Mechanics of the Cape Coast Metropolis, Ghana. *Journal of Ophthalmic and Vision Research*, *11*(1), 78-83. https://doi.org/10.4103/2008-322X.158890.

Bhopal, R. 2002. Concepts of Epidemiology. New York: Oxford University Press Inc.

Bigambo, F. M. (2016). Occupational Health Risks Among Cosmetologist: A Case of Kinondoni Municipality Dar Es Salaam, Tanzania. *Journal of Multidisciplinary Engineering Science Studies*, *2*(8), 766–773.

Ferreira, A. P. (2013). An assessment of occupational health risks in female hairdressers forefront to xenobiotics. *Environmental Occupational Science*, *55*(21), 190–198.

Fox, N., Hunn, A., & Mathers, N. (2007). Sampling and Sample Size Calculation Authors. National institute for Health Reasrch for the East Midlands Retrieved from http:// www.rds-eastmidlands.nihr.ac.uk/pdf.

Johansson, G. M., Jönsson, A. G., Axmon, A., Lindh, C. H., Lind, M., Gustavsson, M., et al. (2014). Exposure of hairdressers to ortho- and meta-toluidine in hair dyes. *Occupuation Environimental Medicine*, *72*(1), 57–63. https://doi.org/10.1136/oemed-2013-101960.

Kim, D., Yeol, M., Choi, S., Park, J., Hye-Ji, L., & Kim, E. A. (2016). Reproductive disorders among cosmetologists and hairdressers. *International Archives of Occupational and Environmental Health*, *89*(5), 739–753. https://doi.org/10.1007/s00420-016-1112-z.

Kumah, B. D., Abdul-kabir, M. Aidoo, F., Kuutiero, I. W., Ablordeppey, R. K., Sarpong, S., et al. (2017). Prevalence of Ocular Conditions among Hairdressers in the Kumasi Metropolis, Ghana. *BAOJ Opthalmology*, *1*(3), 1–6.

Kumah, D. B., Mohammed, A., Bisiw, J. D., Kabir, M. A., & Osae, E. A. (2016). Ocular conditions among singed – hide

butchers at The Kumasi abattoir. *Epidemiological Research*, *2*(1), 1–24. https://doi.org/10.5430/jer.v2n1p20.

Mrema, E. J., Ngowi, A. V, & Mamuya, S. H. (2015). Status of Occupational Health and Safety and Related Challenges in Expanding Economy of Tanzania. *Annals of Global Health*, *81*(4), 538–547. https://doi.org/10.1016/j.aogh.2015.08.021.

Nshunju, R. K. (2012). Compliance to Occupational and Public Health Requirements and Associated Factors in Barbershops and Hair Dressing Salons, A case of Kinondoni Municipality , Dar es Salaam, Tanzania. [Master thesis] Muhimbili University of Health and Allied Sciences. Retrieved from ihi.eprints.org.

Occupational Health and Safety Act; United Republic of Tanzania. 2003. Retrieved from https://www.lrct.go.tz/download/laws_2003/05 2003_The%20Occupational%20Health%20and%20Safety% 20Act,%202003.pdf

Omoti1 AE, Waziri-Erameh, J. M., & Enock, M. (2008). Ocular disorders in a petroleum industry in Nigeria. *Eye (London)*, *22*(7), 925–929. https://doi.org/10.1038/sj.eye.6702772.

Pallant, J. (2003). Spss survival manual (2nd edn). Australia. Retrieved from www.allenandunwin.com/spss.htm/pdf.

Peate, W. F. (2007). Work-Related Eye Injuries and Illnesses. *American Family Physician*, *75*(7), 1017–1020.

Public Health Act; United Republic of Tanzania. 2009. Retrieved fromhttps://www.ilo.org/wcmsp5/groups/public/--ed_protect/---protrav/--ilo_aids/documents/legaldocument/wcms_151286.pdf

Robinson, E. N., & Arcury, T. A. (2011). Eye Health and Safety Among Latino Farmworkers. *Journal of Agromedicine*, *16*(2), 143–152. https://doi.org/10.1080/1059924X.2011.554772.Eye.

Tsigonia, A., Lagoudi, A., Chandrinou, S., & Linos, A. (2010). Indoor Air in Beauty Salons and Occupational Health Exposure of Cosmetologists to Chemical Substances. *International Journal of Environmental Research and Public Health*, *7*, 314–324. https://doi.org/10.3390/ijerph7010314.

Varma, R., Vajaranant, T., Wu, S., & Torres, M. (2016). Visual Impairment and Blindness in Adults in the United States: Demographic and Geographic Variations From 2015 to 2050. *American Medical Association Opthamology,* 134(7):802-809. doi:10.1001/jamaophthalmol.2016.1284.

Volquind, D., Bagatini, A., Massaro, G., Monteiro, C., Londero, J. R., & Benvenutti, G. D. (2013). Occupational Hazards and Diseases Related to the Practice of Anesthesiology, *Brazillian Journal of Anasthesiology*, 63(2), 227–232.