

Conjunctival Disorders Among Fire Service Personnel in the Kumasi Metropolis, Ghana

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ABSTRACT

Background: Occupational diseases are a major global concern. Firefighting is associated with numerous health hazards. However, the ocular problems that fire fighters endure are understudied. The purpose of this study was to determine conjunctival disorders and other ocular morbidities prevalent among fire service personnel in the Kumasi Metropolis of Ghana.

Methodology: A cross-sectional study was conducted in all five fire stations in the metropolis. A total of 150 personnel aged 20 to 60 years were examined. Comprehensive ocular examination was carried out which included ocular and occupational history, visual acuity measurement, ophthalmoscopy and visual field test by confrontation. The Statistical Package for Social Scientists (SPSS) version 16.0 was used to analyze the data. The tool employed was descriptive statistics and Chi-square test was used to find out significant differences between comparable categorical groups.

Results: Out of the 150 personnel, 66.7% were male and 33.3% were female. The common ocular diseases were pinguecula (21.3%), pterygium (15.3%), allergic conjunctivitis (8.0%), dry eyes (5.3%) and retinal abnormalities (4.0%). The prevalence of ocular morbidities among the fire service personnel was 57.3%. Ocular diseases were found to be more prevalent among males (40.7%) than females (16.7%). Conjunctival disorders significantly increased with longer duration of service, but no significant association was found for non-conjunctival disorders.

Conclusion: The study revealed a high ocular morbidity rate in the fire service personnel and underscores the need for regular screening procedures and strategies to identify and manage non-blinding conditions that interferes with productivity as well as potentially blinding conditions among personnel for timely intervention.

KEYWORDS

Conjunctival Disorders; Fire Service Personnel; Non-Conjunctival Disorders.

INTRODUCTION

Some occupations are known to have serious harmful impact on health. Over a million workers in the UK suffer a health condition caused or worsened by their work [1]. Occupational

diseases like firefighting have an immediate adverse effect on work efficiency and productivity [2]. Firefighting poses serious risks including ocular hazards to personnel. People involved in occupations like firefighting, mining and construction suffer

serious health conditions including cardiovascular disorders, musculoskeletal disorders, sleep disorders and traumatic injuries that could lead to sudden deaths [3-6].

Ocular morbidity can be referred to as the relative incidence of eye diseases. It can also be defined as a disease state, disability or poor health due to eye diseases. Fire service personnel in performing their duties face danger from exposure to smoke, dust, extremely high temperatures (1200°C to 1400°C) and issues surrounding personal protective equipment, all of which pose a threat to their ocular health [7]. Occupation-related eye conditions contribute to the global statistics of ocular morbidity and the prevalence of such conditions among workers especially firemen can affect work output or productivity [8]. Investigating the occupational association of eye diseases will increase knowledge about how these diseases are related to occupations and inform strategic planning and implementation of policies to prevent or minimize the risks and occurrence of these occupational disorders, which could increase health and productivity.

Firefighting has become very important in the Kumasi Metropolis of Ghana over the past few years. In 2015 alone, the Kumasi Central Market suffered not less than five major fire outbreaks, each of which required several hours of intense firefighting by fire service personnel to be quenched. Within the first week of January 2016, there had been three major fire outbreaks in suburbs such as Aboabo and Adum, notwithstanding minor household fires and burning accident vehicles on the Kumasi-Accra highway. Personal communication with firefighters and common observation has revealed that most firefighters wear protective clothing but not goggles in their line of work. This exposes their eyes to intense heat, smoke, dust, exhaust particles and soapy liquids that comes with regular firefighting. This study was done to determine ocular morbidities prevalent among fire service personnel in the Kumasi Metropolis of Ghana. Data from this study will create awareness among the fire personnel locally and globally and also aid in policy formulation.

METHODS

Study Population and Sampling

A descriptive cross-sectional study was conducted among fire service personnel in the Kumasi Metropolis, Ghana. There were five fire stations with a total population of 294. The sample size for the study was calculated to be 135 using Epi Info version 7.1.5.2 (expected frequency 20.3%, 5% limits, 95% confidence level) [7]. A total of 150 fire personnel were studied for various ocular morbidities between 7th July and 8th August, 2014.

Data Collection

In each of the stations, the subjects were registered with a structured questionnaire administered by one of the researchers in the local (Twi) language. The questionnaire was used to obtain data on the personal, medical and occupational information of the personnel. A battery of eye examinations namely visual acuity measurement, external eye examination and fundoscopy were carried out on all subjects using Snellen's chart (6metres), pentorch and ophthalmic loupe, and Welch Allyn Direct Ophthalmoscope. Visual field test by confrontation was also carried out for all participants. All examinations findings were detailed on structured record forms and cross-checked for completeness of data before each subject was discharged. Diagnoses were made on the presence of a condition in one or both eyes of a study subject.

Data Analysis

The Statistical Package for Social Scientists (SPSS) version 16.0 (SPSS, Inc., Chicago, IL, USA) was used to analyze the data. Continuous variables were expressed as mean \pm standard deviation (M \pm SD). Descriptive statistics and Chi-square test were employed to find significant differences between comparable categorical groups. T-test was employed to analyze differences in mean values between two groups. Statistical significance was set at p values less than 0.05 ($p < 0.05$).

Ethical Considerations

This study was reviewed and approved by the Committee on Human Research, Publications and Ethics of the Kwame Nkrumah University of Science and Technology, School of Medical Sciences, Kumasi. Written approval was obtained from the Headquarters of the Ghana National Fire Service in the Kumasi Metropolis. The study and all eye examination procedures were clearly explained to all participants. All subjects, before they were registered, agreed to and signed informed consent forms. The study was carried out in accordance with the tenets of the Declaration of Helsinki.

RESULTS

A total of 150 personnel (107 field workers and 43 office workers) aged between 20 and 60 years took part in the study representing a response rate of 85.6%, a rate similar to that of other occupational health hazards studies [9]. They consisted of 100 (66.67%) males and 50 (33.33%) females. The mean age of the respondents was 40.4 ± 5.2 years. The age and gender distributions of the respondents are illustrated in Table 1. 3. The two groups were comparable in terms of age and male to female ratio. The mean age of the field workers (41 ± 3.5 years) was statistically comparable with that of the office

workers (44 ± 2.8 years; $p = 0.512$) and the male to female ratio was approximately the same in both groups (3.1:1 for field workers and 2.9:1 for office workers). Approximately a quarter of both field (25.2%) and office (25.6%) workers had served for more than 5 years. Using Pearson’s correlation, a stronger positive correlation ($0.82, p = 0.031$) was found between ocular morbidity and duration of service than between ocular morbidity and age ($0.51, p = 0.033$) among the personnel.

Table 1: Age and gender distribution of respondents.

Age	Gender		Total	Percentage (%)
	Male	Female		
20-30	14	16	30	20.0
31-40	22	6	28	18.7
41-50	53	23	76	50.7
51-60	11	5	16	10.6
Total	100	50	150	100

The prevalence of ocular morbidity among the respondents was 57.33%. Ocular diseases were found to be more prevalent among males (40.67%) than females (16.67%) ($p = 0.056$) and significantly increased with age ($p = 0.042$). The prevalence of various ocular diseases is shown in Table 2. The most prevalent ocular condition was pingueculum (21.3%), followed by pterygium (15.3%). Field workers reported with higher ocular morbidity (47.66%) than office workers (34.88%) and the difference was statistically significant ($p = 0.047$).

Table 2: Ocular diseases among respondents.

Condition	Gender (Prevalence)		Total	Prevalence (%)
	Male (%)	Female (%)		
Pingueculum	27 (27.0)	5 (10.0)	32	21.3
Pterygium	14 (14.0)	9 (18.0)	23	15.3
Allergic conjunctivitis	9 (9.0)	3 (6.0)	12	8.0
Dry eyes	3 (3.0)	5 (10.0)	8	5.3
Glaucoma suspect	2 (2.0)	2 (4.0)	4	2.7
Cataract	3 (3.0)	0 (0.0)	3	2.0
Retinitis pigmentosa	1 (1.0)	1 (2.0)	2	1.3
Chalazion	2 (2.0)	0 (0.0)	2	1.3

Allergic conjunctivitis was recorded in 8% of the personnel, and more males (75% of those with the condition) had this condition than females which was found to be statistically significant ($p = 0.033$). Some of the symptoms of allergic conjunctivitis reported by the respondent were itching (13.4%), tearing (9.4%), red eyes (5.4%) and burning sensation (3.4%). Field workers recorded higher prevalence of pingueculum (26.2%), pterygium (10.3%) and allergic conjunctivitis (6.5%) than of-

fice workers (9.3%, 7.0%, 4.7% and 4.7% for pingueculum, pterygium and allergic conjunctivitis respectively) as shown in Figure 1. These differences were found to be statistically significant for pingueculum ($p = 0.041$) and pterygium ($p = 0.044$) but not for allergic conjunctivitis ($p = 0.065$).

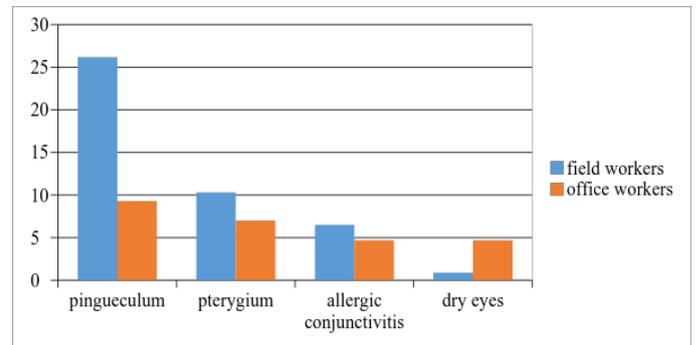


Figure 1: Prevalence of ocular surface disorders among field and office workers in percentages.

Some personnel were also diagnosed of non-conjunctival disorders (glaucoma, cataract, retinitis pigmentosa, chalazion). The distribution of ocular morbidity among subjects is shown in table 2. The study also explored the duration of service for the personnel. The minimum reported was 1 year and the maximum was 19 years. The duration of service was categorised into two groups: up to 5 years and more than 5 years and is shown in Table 3. The association between eye disease detected and the duration of service was examined. The prevalence of conjunctival disorders appeared to increase with increasing duration of service and was found to be statistically significant in all cases (p values of 0.038, 0.044 and 0.03 for pingueculum, pterygium and allergic conjunctivitis respectively), but not for non-conjunctival disorders (p values of 0.121, 0.081, 0.132 and 0.099 for glaucoma, cataract, retinitis pigmentosa and chalazion respectively).

Table 3: Duration of service and associated prevalence of ocular conditions.

Duration of service	Number of workers	Prevalence of conjunctival disorders (%)	Prevalence of non-conjunctival disorders (%)
Up to 5 years	112	45.5	2.7
More than 5 years	38	63.2	21.1

DISCUSSION

Generally, there is a paucity of information on the prevalence of ocular morbidity among fire service personnel and more specifically, in Kumasi, where this study was conducted. This study reported a high prevalence of ocular morbidity among fire service personnel. A similar high prevalence has been identified among other workers such as butchers, miners and

cocoa farmers [10, 11]. We also revealed in this study that a significantly higher percentage of field workers suffered conjunctival disorders (pingueculum, pterygium and allergic conjunctivitis) than office workers. Primarily, this observation could be as a result of the chronic exposure of field workers unlike office workers to allergens and air pollutants that can adversely affect the ocular surface. Allergens such as dust, pollen, exhaust particles and smoke are known to be significant causes of conjunctival disorders [12, 13]. Also, reports of variable prevalence rates of conjunctival disorders in both outdoor workers and the general population have been made [2, 8, 14-18]. Since the prevalence of these conjunctival disorders in the general population of Kumasi is not known and a control group could not be recruited in this study, it cannot be said with precision that the prevalence rate recorded among the personnel is higher than in the general population of Kumasi. We therefore suggest that this result is interpreted with caution. Nonetheless, most of these studies associated higher prevalence of conjunctival disorders with outdoor activities (due to exposures to ultraviolet radiations from sunlight) and dust. It is likely that the high prevalence in this study could be due to similar factors while age is recognized as a possible confounding factor. Even though fire is not known to emit UV radiations, it has been reported that a body heated to incandescent temperature emits significant UV radiations an occurrence fire fighters are likely to encounter in blazing fire outbreaks. Also, dry heat has been associated with conjunctival disorders [19, 20]. This study found a significant association between conjunctival disorders and gender; males (73.6%) had a higher prevalence compared with females (26.4%) ($p = 0.041$). This finding agrees with that of other studies conjunctival changes tend to occur in males twice as frequently as in females.

This study revealed a significant positive association between conjunctival disorders and longer duration of service among the personnel. Longer exposures to harmful radiation and smoke have been mentioned as precursors to developing pterygium, pingueculum and conjunctivitis in other studies [12, 21, 22]. This study also revealed lower prevalence of retinal abnormalities (glaucoma, retinitis pigmentosa) and cataract, similar to findings in other studies among other workers in the metropolis [10]. Although this study could not investigate the association between these conditions and the nature of work of the personnel, other studies have associated these conditions with underlying ocular and systemic diseases such as diabetes and cataract [23, 24]. The concern among this population is that these conditions cause progressive vision loss that leads to visual impairment and blindness: studies have reported cataract to be the most common cause of severe visual im-

pairment in blacks, while glaucoma is the second most common cause of blindness in blacks (26.0%) [25]. Investigating the association between firefighting and these non-conjunctival disorders was beyond the scope of this study. However, people with a positive family history have been reported to be at risk of these conditions, and trauma to the eye (a common occupational hazard) has been indicated in cataract [20]. It is most important that such personnel are managed and monitored on regular basis. Even though our study did not assess eye care seeking behavior among these personnel, other studies have established that Ghanaians have poor eye care seeking behaviour, and thus it is possible that such personnel would only self-report for eye examination when these conditions have advanced and caused significant visual impairment or possibly irreversible vision loss as in glaucoma, whereas early detection and monitoring/management through regular eye examinations would save useful vision [26].

LIMITATIONS AND FURTHER STUDIES

Due to lack of adequate resources, a control group from the general population of Kumasi could not be recruited for this study. As such, the correlation between the reported ocular morbidities and age in the general population could not be compared with the correlation with duration of service among the personnel in this study. Further studies should consider studying a sample from the general population for comparison.

CONCLUSION

This study has revealed that the fire personnel who were directly involved in firefighting had higher prevalence of conjunctival disorders than their colleague office workers. These disorders cause ocular discomfort and could lead to significant visual impairment if left unchecked. In the wake of the rising incidence of fire outbreaks in the metropolis and other parts of the world, we recommend that authorities of fire departments should ensure that appropriate face shields are made available to, and utilized by these workers in the course of their work. We also recommend that regular eye examination and eye health education, with emphasis on managing symptoms of ocular surface allergies, should be incorporated into training of fire service personnel and at workshops.

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