



Distribution of Ocular Disorders in Communities Affected by Crude Oil-spillage in Rivers State

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Authors' contributions

This work was carried out in collaboration among all authors. Author EAA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors NEC and SCE managed the analyses of the study. Author SCE managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/OR/2019/V11i330126

Editor(s):

(1) Dr. Stephen G. Schwartz, Department of Clinical Ophthalmology, Bascom Palmer Eye Institute, University of Miami Miller School of Medicine, USA.

Reviewers:

(1) Adnan Aksoy, Sutcu Imam University, Turkey.

(2) Tayo Julius Bogunjoko, Nigeria.

(3) Italo Giuffre, Catholic University of Rome, Italy.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/53290>

Original Research Article

Received 18 October 2019
Accepted 21 December 2019
Published 25 December 2019

ABSTRACT

Objective: To assess the ocular disorders prevalent in communities affected by crude oil-spillage in Rivers State.

Methods: A cross sectional study involving participants at a one day free eye screening event in Ogu Bolo Local Government area of Rivers State. Participants had comprehensive ocular examination, a pen torch examination of the anterior segment and a direct funduscopy using the Welch Allyn Ophthalmoscope, Tonometry was done using the Keeler Pulse air tonometer and those with minor ocular pathologies were treated on site while more chronic disease were referred to a private Ophthalmology group practice.

Statistical Analysis: Data was analysed using the Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics employed mean, median, standard deviation and range values. Frequencies and proportions were used for categorical variables.

Results: The mean age was 46.76±16.03 years while the age range was 1-90 years. The male to female ratio was 1:1.1. About 57.9% and 57.1% of the people had visual acuity better than 6/18 in

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the right and left eyes respectively. About 19.7% and 20.1% had visual acuity worse than 6/36 in the right and left eyes respectively. The commonest Ocular disorder was Refractive Error (33.6%). This was followed by Presbyopia (17.8%), Cataract (15.1%), Allergic Conjunctivitis (6.5%) while Ocular albinism was least (0.2%).

Conclusion: Ocular anterior segment disorders are prevalent in communities affected by oil spillage and could be due to exposure to petroleum-related chemical irritants.

Keywords: Anterior segment; communities; irritants; oil spillage.

1. INTRODUCTION

Oil extraction and spillage may cause extensive environmental contamination and this may affect the health of population living in surrounding areas [1]. The health effects of exposure to oil related contamination have been mainly studied after oil spills among clean-up workers and residents of the affected coastal areas [2]. Populace living around oil exploring and refining area are exposed to various chemical irritants used in the refining of petroleum products. These include gaseous and particulate matter such as hydrogen sulphide and other hydrogen gases, catalyst dust, ammonium compounds, carbon black, fuel gases, and other hydrocarbons [3]. They are also exposed to heat, steam, acids, caustic soda, asbestos, radioactive materials, and liquid lead compounds [3]. These exposure is heightened in event of oil spillage at which time these chemicals may affect the eyes especially if protective goggles are not worn. They could also be exposed to non-petroleum related hazards like trauma and smokes.

The ocular surface is a delicate structure and it is vulnerable to potential environmental insults especially because of its anatomic location [4,5].

Ocular side effects associated with exposure to these irritants include photokeratitis, characterized by pain and grittiness. This could result in reduced corneal sensitivity and subsequently damage to the cornea. Long term exposure predisposes the eye to ocular surface disorders such as pterygia, pingueculae, band keratopathy and climatic drop keratopathy [6]. Ocular surface diseases affect sight as well as quality of life and even blindness if not managed properly. Other ocular disorders that could result from such exposure include blepharitis, presbyopia, cataract and glaucoma etc [7].

These insults can however be reduced when the individuals are properly educated on the importance of seeking health care early and proper use of safety measures to prevent ocular disorder [7,8].

2. METHODOLOGY

2.1 Methods

A cross sectional study involving participants at a 4- day free eye screening event in Ogu Bolo Local Government area of Rivers State between August-September 2018. Ogu- Bolo Local Govt. area is one of the Local Government areas in Rivers State with a population of 74,683. It has several satellite villages and fishing settlements. The inhabitants are mainly fishermen but recently a lot of illegal bunkering activities have thrived in these areas leading to environmental degradation and pollution.

On each day of the outreach a health talk was given prior to screening. Participants had comprehensive ocular examination including visual acuity estimation using literate and illiterate Snellen distant acuity charts, Near vision was tested using near chart, then each patient had a pen torch examination of the anterior segment and a direct funduscopy using the Welch Allyn Ophthalmoscope, Tonometry was done using the Keeler Pulse air tonometer and those with minor ocular pathologies were treated on site while more chronic disease were referred to a private Ophthalmology group practice.

2.2 Statistical Analysis

Data was analysed using the Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics employed mean, median, standard deviation and range values. Frequencies and proportions were used for categorical variables.

3. RESULTS

Data were collected from a total of 1726 residents of oil-spillage communities.

The mean age was 46.76±16.03 years while the age range was 1-90 years as shown in Table 1.

Table 1. Summary of ages of residents

| Age in years | Mean±SD | Median | Min - Max |
|--------------|---------------------|-------------|--------------|
| | 46.76 ± 16.03 years | 46.50 years | 1 – 90 years |

SD – Standard deviation

Table 2. Frequency of male and female community residents

| Sex | Number | % |
|--------|--------|-------|
| Female | 929 | 53.8 |
| Male | 797 | 46.2 |
| Total | 1726 | 100.0 |

Table 3. Visual acuity findings

| | Visual acuity | Number | % |
|-----------|------------------|--------|------|
| Right Eye | Better than 6/18 | 999 | 57.9 |
| | 6/18 - 6/36 | 386 | 22.4 |
| | Worse than 6/36 | 341 | 19.7 |
| Left Eye | Better than 6/18 | 985 | 57.1 |
| | 6/18 - 6/36 | 394 | 22.8 |
| | Worse than 6/36 | 347 | 20.1 |

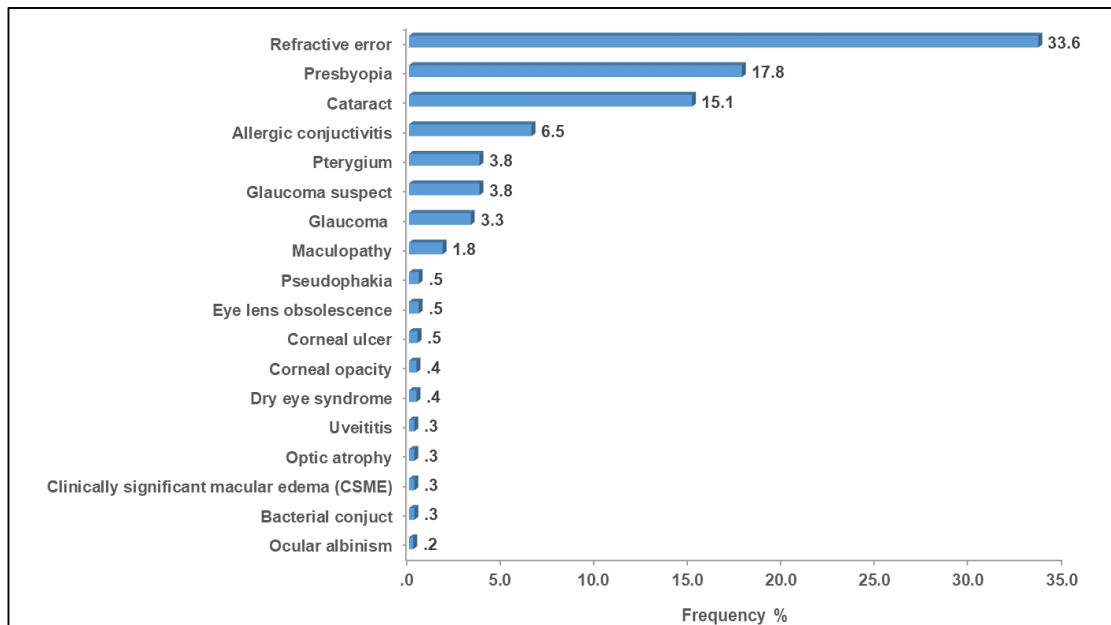


Fig. 1. Distribution of eye disorders among community residents of oil-spillage communities

The male to female ratio was 1:1.1 as shown in Table 2.

About 57.9% and 57.1% of the populace had visual acuity better than 6/18 in the right and left eyes respectively. About 19.7% and 20.1% had visual acuity worse than 6/36 in the right and left eyes respectively as shown in Table 3.

The commonest Ocular disorder was Refractive Error (33.6%). This was followed sequentially by

Presbyopia (17.8%), Cataract (15.1%), Allergic Conjunctivitis (6.5%) while Ocular albinism was least (0.2%) as shown in Fig. 1.

4. DISCUSSION

The study was carried out in communities affected by oil spillage and thus members of the community are therefore constantly exposed to pollutants and chemical irritants which include carbon black, hydrogen sulphide and other

hydrogen gases, ammonium compounds, catalyst dust etc [3].

The mean age was 46.76 ± 16.03 years with an age range of 1-90 years. This shows that they would be exposed to variety of ocular diseases because virtually all age groups were represented. The commonest presentation was refractive error and this was in keeping to the findings by Ani, et al., Anyiam, et al. and Abraham et al in their studies in same oil rich Niger Delta region of Nigeria [6,9,10]. The high prevalence of refractive error may not solely be related to these irritants because refractive error was also found to be the commonest cause of mild and moderate visual impairment in the countrys (Nigerian National blindness survey) survey. This could therefore be due to the common occurrence of these conditions in the general population. The high incidence of presbyopia could be explained by the fact that a good number of the populace were in the presbyopic vulnerable age group bearing in mind the mean age of the study population. Cataract constituted 15.1% and this could be both age dependent and also exposure to these irritants.

Ocular surface diseases like Allergic conjunctivitis and Pterygia constituted more than 10% of ocular diseases. Tebepah [11] in a similar study found allergic conjunctivitis to be the commonest eye disorder. Acute and chronic ocular irritation and exacerbated allergic conjunctivitis could be due to exposure to toxic refinery chemicals [3,10,12,13]. Maculopathy constituted 1.8% of burden of eye disease. This could be age-dependent. Furthermore, poor nutrition following poor crop yield owing to the fact that the lands have been taken over by oil spillage could account for it. In addition to maculopathy, corneal dryness and subsequent ulceration could also arise from poor nutrition especially when they eat food deficient in vitamin A, C and E following poor crop yield.

All these could be prevented with prompt environmental clean-up. However while the community awaits comprehensive clean up, some measures of ocular protection could be provided. For instance, the Fire Safety and Environmental Protection Department (FSEPD) of the Nigerian National Petroleum Company ensures safety of their workers by ensuring that protective gadgets are provided and worn by them but unfortunately this does not cover the members of the community and thus leaves their

eyes exposed to various irritant chemicals and dust particles.

The presence of illegal oil refining activities have not helped either and the environmental population associated with these activities are enormous [14].

5. CONCLUSION AND RECOMMENDATION

Ocular anterior segment disorders are prevalent in communities affected by oil spillage and could be due to exposure to petroleum-related chemical irritants. To prevent chronic exposure to these irritants, there should be prompt environmental clean-up in event of oil spillage. Temporary ocular protective measures should also be made available while preparation for clean-up is being made to minimize ocular injuries.

CONSENT

It is not applicable.

ETHICAL APPROVAL

As per international standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:

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