Research Article

Ocular Conditions among Small Scale Miners in Selected Communities in the Ashanti Region of Ghana

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Abstract

Objectives

To determine the prevalence of common ocular conditions among small scale miners in the Ashanti region of Ghana.

Material and Methods

A cross-sectional study across three conveniently chosen mining communities was carried out. Two hundred (200) miners were purposively sampled. History taken from participants included participants’ demographics, ocular and occupational history. Ocular examination included ophthalmoscopy and visual acuity. Diagnoses were made on the presence of a condition(s) in either or both eyes. The Statistical Package for Social Sciences (SPSS) version 17.0 was used to analyze data collected. Descriptive statistics and Pearson’s Chi Square test were employed.

Results

Overall, 160 respondents were examined. The overall prevalence of eye diseases was 83.0%. Conjunctivitis had the highest prevalence (40.0%) followed by dry eye (9.4%), pinguecula (8.1%), pterygium (7.5%) and cataract (5.6%). Refractive errors recorded 10%.

Conclusions

The study revealed a high ocular morbidity rate (83.0%). Uptake of regular eye examination and eye health education are recommended for these miners since they are exposed to several risk factors which play important roles in ocular morbidity.

Keywords: Mining; Ocular Morbidity; Pterygium; Pinguecula; Refractive Error; Conjunctivitis.

Introduction

Some occupations are inherently dangerous and pose significant threat to the health of the workers involved with them. For some industrial workers, daily exposure to hazardous agents like extreme temperatures, dust and radiations area common occurrence. Others are almost always exposed to loud noise, vibrations, heavy metals and chemicals like mercury, lead and organic solvents [1-3].

Like many other indigenous industry workers, small scale miners suffer from health threatening conditions related to their jobs. Some of these workers suffer traumatic injuries, tuberculosis, heavy metal poisoning, eye diseases and depressive disorders [7]. A report showed that over a million workers suffer ill health caused or made worse by the work they do [8]. This report suffices to say that small scale miners could develop certain morbid states or have an existing health condition worsened by their mining job.

These artisanal (galamsey) miners are mostly self-employed and they employ simple tools and crude methods during the mining processes. Most of the gold artisanal mining sites in Ghana use elemental mercury during the concentration processes: mercury is mixed with gold-containing material to form a mercury-gold amalgam which is then heated to vaporize mercury to obtain gold. Mercury, especially the vaporized form has been implicated in neurotoxicity, cardiovascular toxicity, cytogenetic alterations and immune impairments [9]. Other studies showed that some elemental mercury from these mining zones could find its way into systems of lactating mothers and ultimately into breast milk, this could affect the health of breastfeeding babies. Persons who accidentally consume fish captured from the mercury-laden rivers where artisanal mining is carried out also have significant health consequences [10,11].

Some other conditions which have been associated with this form of mining include Schistosomiasis, skin disorders, river blindness and deafness [12-14]. Nearly all of such miners operate in poor and sordid working environment without adherence to proper health and safety guidelines. Most of them could suffer from fatigue, general body aches, breathing and sleeping disorders [15,16].

This study was an attempt to study the common eye conditions prevalent...
among artisanal miners in some selected communities in the Ashanti region of Ghana.

Materials and Methods

A descriptive cross-sectional study was carried out across three purposively selected artisanal mining sites in the Ashanti region of Ghana. In all, a total of 200 participants were conveniently sampled from the selected sites.

Interviewer administered questionnaires detailing the participants demographic profiles, ocular and occupational history were issued to be filled by the participants. A comprehensive eye examination was carried out on all participants. Distance visual acuity was assessed for each participant using a Snellen chart at six (6) meters. Ophthalmoscopy was carried out using a Welch Allyn direct Ophthalmoscope. A pen torch and ophthalmic loupes were employed in external eye examination. Diagnosis was made on the presence of a condition in one or both eyes of a participant.

Ethical Considerations

The study and all the mentioned eye examination procedures were clearly explained to all participants. Informed consent was sought from all participants. Permission to carry out the study was sought from the authorities at each of the selected mining center. The study was conducted in adherence to the tenets of the Declaration of Helsinki.

Data Analysis

Data collected from the study were analyzed using the Statistical Package for Social Scientists (SPSS) version 17.0 (SPSS, Inc., Chicago, IL, USA). Continuous variables are expressed as mean ± standard deviation (M ±SD). Descriptive statistics and Person’s Chi square tests were employed to find significant differences between comparable categorical groups. The T-test was used to compare independent groups and p values less than 0.05 was considered as significant.

Results

Overall, 160 out of the 200 conveniently sample participants were examined. These respondents comprised 85.6% males and the 14.4% females with an age range of 10–60 years. The modal age range was 20–30 years. Mean age for all participants was 30.9 ± 8.1. There was no significant difference in age between males and females (p>0.05) Table1 summarizes the age and gender distribution of the study respondents. History gathered from the participants revealed that 23.8% of the 160 study respondents had refractive errors of different forms while 83.0% suffered from various forms of non-refractive eye conditions. We did not detect any clinically significant posterior segment eye disease. Most of the conditions we detected were limited to the anterior segment of the eye. Retinal conditions including but not limited to suspicious glaucomatous changes have all been broadly classified as retinopathies. The commonest condition diagnosed was conjunctivitis (40.0%), followed by dry eyes (9.4%), Corneal ulcer (2.5%) and subconjunctival hemorrhage (0.6%) were among the least diagnosed conditions. Some of the respondents had more than one eye condition. Table 2 represents the different eye conditions detected among them respondents.

Table2: Non-refractive eye conditions detected among respondents.

<table>
<thead>
<tr>
<th>Eye condition</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis</td>
<td>40.0%</td>
</tr>
<tr>
<td>Dry eyes</td>
<td>9.4%</td>
</tr>
<tr>
<td>Pterygium</td>
<td>8.1%</td>
</tr>
<tr>
<td>Pingoecula</td>
<td>7.5%</td>
</tr>
<tr>
<td>Cataract</td>
<td>5.6%</td>
</tr>
<tr>
<td>Retinopathies</td>
<td>8.7%</td>
</tr>
<tr>
<td>Cornealulcers</td>
<td>2.5%</td>
</tr>
<tr>
<td>Subconjunctival haemorrhage</td>
<td>0.6%</td>
</tr>
<tr>
<td>Uveitis</td>
<td>0.6%</td>
</tr>
<tr>
<td>Total</td>
<td>83.0%</td>
</tr>
</tbody>
</table>

Visual acuity tests also showed that majority (92.5%) of the respondents recorded normal unaided visual acuities values of 6/6 or better. Only one (1) respondent recorded a poor acuity of 6/60 or worse. Table 3 shows the frequency distribution of the various levels of visual acuity.

Table3: Distribution of visual acuity.

<table>
<thead>
<tr>
<th>Visual acuity</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6/5-6/6</td>
<td>148</td>
<td>92.5</td>
</tr>
<tr>
<td>6/9-6/18</td>
<td>6</td>
<td>3.8</td>
</tr>
<tr>
<td>6/24-6/36</td>
<td>5</td>
<td>3.1</td>
</tr>
<tr>
<td>≥6/60</td>
<td>1</td>
<td>0.6</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100%</td>
</tr>
</tbody>
</table>

Assessment of knowledge (awareness) of and the use of personal protective equipment (PPE) showed that approximately 64.4% knew of goggles while 3.75 % knew of safety glasses and others also had knowledge about other forms of PPEs. Regarding the use of PPE, 35.6% used one form of PPEs or the other. Some of the respondents knew...
of more than one form of PPEs. There was no significant association
between being knowledgeable about a PPE and the use of a PPE (p
>0.05). Table 4 shows the number persons who knew about a PPE and
those who did use a PPE.

When study participants were interviewed on how often they voluntarily
reported for eye checkups within a year, the study revealed that as many
as 149 (93.1%) of the respondents never self-reported for eye checkups
while approximately 6.9% voluntarily presented for eye checkup, at least
once within a year.

**Discussion**

The study respondents were mostly males (85.6%); this is because
like many other artisanal jobs in Ghana, small scale mining is a male
-dominated industry but this depends on the location of the mining
operations. Some studies show that in certain artisanal mining areas in
Ghana, the number of females rivals that of male miners [17]. Competing
socioeconomic statuses and familial responsibilities have been implicated
as some reasons why there may be higher number of females artisanal
miners in certain areas [18, 19]. There are also certain indigenous
industries in Ghana that are dominated by females [20].

The age characteristics (table 1) showed that a significant proportion of
the study respondents were middle aged with a few younger and older
outliers. A possible explanation for why artisanal miners in this study
were mostly middle aged persons may be that, crude mining methods
require considerable level of stamina that is typical of these middle aged
persons [21,22]. We found no significant difference in the ages of male
and female respondents( p>0.05). The apparent difference might be
attributed to the observed higher number of males than females in this
study (137 versus 23).

Several studies have reported the presence of different forms of eye
diseases among miners and other industrial workers [23-26]. The most
prevalent eye condition among these miners was conjunctivitis (40.0%).
The work environment of artisanal miners is saturated with particulate
substance like dust and soot from furnaces used for heating mercury
–mineral amalgams. These fine particles could excite conjunctival
inflammation when they come to into contact with the eyes of these
miners [27,28]. The intense sunny conditions in which most of them
work, possible exposure to water pathogens and minute foreign bodies
during the panning process could account for the higher prevalence of
conjunctivitis among these workers [29-31]. Dry eyes (9.4%), pterygium
(7.5%), pingueculum (8.1%) and cataract (5.6%) were some of other
eye conditions found among the miners. These conditions have all
been reported to have a relationship with some occupations [32]. The
prevalence values for each of the conditions reported in our studies
varied from that reported in other studies; our values were greater and
lesser to what other studies found [28,33,34].

Visual acuity findings were similar to what other studies have reported

<table>
<thead>
<tr>
<th>Table 1: Age and gender distribution of respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 4: Awareness and use of Personal Protective Equipment (PPE).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment (PPE)</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Goggles</td>
</tr>
<tr>
<td>Helmet</td>
</tr>
<tr>
<td>Face shield</td>
</tr>
<tr>
<td>Full facerespirator</td>
</tr>
<tr>
<td>Safety glasses with side protection</td>
</tr>
<tr>
<td>Others</td>
</tr>
</tbody>
</table>

Citation: David Ben Kumah, Abdul Kabir Mohammed, Akua Amoanimaa Asare Ankohm and Eugene Appenteng Osae (2015) Ocular
Conditions among Small Scale Miners in Selected Communities in the Ashanti Region of Ghana. BAOJ Med Nursing 1: 010.
Majority of the workers were knowledgeable about personal protective equipment (PPE) such as goggles, face shields, safety glasses, helmets but an incommensurately lesser number used any of these PPEs. Reasons gathered for the non-use of these PPEs by some of workers include unavailability of the PPEs, cost of PPEs, interference and or discomfort in using the PPEs while at work and skin irritations from using some of the PPEs. These and many other reasons agree with what some studies have reported to be barriers to the use of PPEs. We found a statistically insignficant association between the awareness and use of PPEs (p>0.05); other also show that compliance to the use of PPE is attitudinal.

Conclusion

The study revealed an overall high prevalence of eye conditions (83.0%) among the respondents. The most common eye condition was conjunctivitis (40.0%). Many of the respondents knew of personal protective equipment but few of them used them at work. There was generally low voluntary attendance to clinics for eye checkups. Regular eye checkups are recommended for these artisanal miners since they are frequently exposed to several risk factors which could influence the development of ocular morbidities.

Safety education for these workers should focus on encouraging the use of available personal protective equipment.

Further research is required to help understand the relative contributions of different risk factors and how preexisting systemic conditions could influence the development of these eye conditions among these miners.

References
