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Research Article

Relationship Between Glaucoma Comorbidity with Cataract and Dry Eye Disease and Work Productivity Among Civil Servants in Imo State Secretariat, Owerri, Nigeria

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Abstract

Glaucoma is the primary cause of permanent blindness globally and is often associated with other ocular diseases, including cataract and dry eye disease. The presence of these disorders may aggravate visual impairment, influence treatment results and impact work performance and productivity. However, there is no evidence about the association between ocular comorbidity and working productivity among occupational populations in Nigeria. This study examined the association between glaucoma comorbidity with cataract and dry eye illness and productivity among government officials working in the Imo State Secretariat, Owerri, Nigeria. A descriptive analytical cross sectional study was conducted among 380 public officials aged between 35 and 65 years selected using multi-stage sampling technique. Data were gathered utilising a standardised, interviewer-administered questionnaire and detailed ocular examinations conducted by certified optometrists. Ophthalmic examinations included visual acuity testing, ophthalmoscopy, intraocular pressure measurement, and Schirmer strip testing for dry eye disease. Data were analysed using Statistical Package for the Social Sciences (SPSS) version 23. The descriptive statistics are expressed as frequencies and percentages. Correlations and regressions were conducted to examine the association between ocular comorbidity and work productivity. Statistical significance was defined as $p<0.05$.Glaucoma was not independently related with impaired job productivity after controlling for other visual diseases. But dry eye disease was most strongly associated with productivity loss, followed by cataract. "Also, a significant but weak positive correlation was found between ocular comorbidity burden and productivity loss ($r \approx 0.18$, $p < 0.001$), suggesting that higher numbers of coexisting ocular conditions were associated with increasingly greater loss of productivity at work among civil servants. Glaucoma alone was not an independent predictor of productivity loss, however the combination of glaucoma with cataract and dry eye illness was associated with decreased workplace productivity. Occupational health programmes among civil servants should include routine comprehensive eye examination, workplace eye health education, ergonomic interventions and periodic visual health assessments, to aid early detection, prompt management and preservation of visual function and work performance.

Keywords: *Cataract. Dry eye disease. Ocular comorbidity.Productivity. Civil servants. Occupational health.*

Introduction

Glaucoma is a chronic progressive optic neuropathy characterised by irreversible degradation of retinal ganglion cells and consequent deterioration of the visual field. It is one of the primary causes of permanent blindness in the globe. It is a huge public health problem as the affected people usually stay asymptomatic until the disease reaches severe stages. Current estimates suggest that more than 80 million individuals worldwide are living with glaucoma and this figure is expected to increase to over 110 million by 2040 as populations continue to age[1]. People of African heritage have a disproportionately higher burden of glaucoma, with earlier onset, faster development and greater risk of blindness than

many other ethnic groups. As a result, glaucoma continues to be a leading cause of visual impairment and socioeconomic burden, especially in sub-Saharan Africa [2].

Glaucoma is seldom an isolated ocular disease. It is often associated with other age-related eye disorders, most notably cataract and dry eye disease, both of which may further damage visual performance and complicate clinical care. Cataract is defined as progressive opacification of the crystalline lens and is the major global cause of reversible blindness[4]. Dry eye disease is a multifactorial illness of the ocular surface characterised by tear film instability and chronic inflammation, and causes symptoms such as ocular discomfort, burning sensation, fluctuating vision, photophobia, and visual tiredness. Glaucoma, when it occurs together with cataract and dry eye disease, presents additional hurdles, because each of these conditions can affect vision by itself, and also complicate diagnosis, treatment and long-term management of the disease[4].

Several theories have been proposed to explain the common association of these eye illnesses. The most important common risk factor for glaucoma and cataract is increasing age. Long-term use of topical antiglaucoma medications, especially those containing preservatives, has been associated with ocular surface toxicity and development or worsening of dry eye disease. Cataract can impair examination of the optic nerve and make monitoring of glaucoma more difficult. Dry eye illness may lead to decreased adherence to glaucoma medicines due to continuous ocular discomfort. Patients with numerous ocular disorders frequently have worse visual handicap, lower vision-related quality of life and higher treatment burden than those with a single ocular disease[5].

As visual performance in the modern workplace has become increasingly vital, the occupational repercussions of ocular comorbidity have become increasingly important. Civil workers spend several hours reading paperwork, using computers, analysing electronic records and other visually demanding administrative chores. Glaucoma, cataract, and dry eye disease may lead to reduced visual acuity, peripheral visual field defects, susceptibility to glare, irritation of the eye, blurred vision, and visual tiredness that may have an impact on focus, speed of reading, task correctness, and decision-making capacity. These impairments might lead to reduced productivity at work due to absenteeism and presenteeism [6].

Productivity, in general terms, is the efficient use of existing resources to generate the desired outputs. In occupational health, productivity is not just the work production, but the capacity of workers to do their jobs well without impairment due to illness or disability[7]. Productivity loss may occur through absenteeism, when employees are not at work due to sickness, or presenteeism, where employees are at work but unable to function to their regular ability due to health-related limits. Visual problems are increasingly recognised as key factors to presenteeism as they often impair work effectiveness long before the onset of complete visual disability[8].

Despite the increasing global awareness of ocular multimorbidity, evidence of its impact on job productivity among civil officials in Nigeria is still scarce. Previous research has largely focused on the clinical features of glaucoma or the co-occurrence of glaucoma with cataract and dry eye disease, with relatively little attention devoted to their combined occupational implications. Understanding the association between ocular comorbidity and job productivity is important for the development of workplace eye health regulations, occupational screening programmes and preventive interventions to preserve visual function and improve employee performance [9].

Therefore, this study explored the association between glaucoma comorbidity with cataract and dry eye illness and job productivity among civil officials working in the Imo State Secretariat, Owerri, Nigeria. The results are expected to provide evidence for the inclusion of comprehensive eye care into occupational health initiatives, and contribute to measures to reduce productivity loss associated with preventive visual impairment.

Materials and Methods

Study Design

This study employed a descriptive analytical cross-sectional design to investigate the relationship between glaucoma comorbidity with cataract and dry eye disease and work productivity among civil servants working in the Imo State Secretariat, Owerri, Nigeria. The cross-sectional design was considered appropriate because it enabled the simultaneous assessment of ocular conditions and work productivity within a defined population at a single point in time.

Study Area

The study was conducted at the Imo State Secretariat, Owerri, the administrative headquarters of the Imo State Government in southeastern Nigeria. The Secretariat, located in New Owerri, serves as the central administrative hub of the state government and houses thirty-two ministries, departments, and government agencies. These include the Ministries of Justice, Agriculture and Food Security, Water Resources, Transport, Health, Education, Special Projects, and Works, as well as the Imo State Civil Service Commission, Hospital Management Board, and Board of Internal Revenue.

The Secretariat comprises several administrative blocks accommodating thousands of civil servants engaged predominantly in office-based duties such as computer use, document processing, record keeping, and administrative management. These visually demanding occupational activities make the Secretariat an appropriate setting for investigating ocular diseases and their impact on work productivity.

Study Population

The study population comprised 380 civil servants aged between 35 and 65 years who were recruited from ten ministries randomly selected from the thirty-two ministries within the Imo State Secretariat. According to the 2024 personnel records obtained from the Imo State Civil Service Commission, the Secretariat had an estimated workforce of 7,800 employees.

Sample Size Determination and Sampling Technique

The sample size was determined using the Yamane (1967) formula for finite populations:

$$n=\frac{N}{1+N(e)^2}$$

where:

- **n** = required sample size
- **N** = study population (7,800)
- **e** = margin of error (0.05)

Substituting the values:

$$n=\frac{7800}{1+7800(0.05)^2}$$

$$n=\frac{7800}{20.5}=380.5$$

The calculated sample size was approximately 380 participants; therefore, 380 civil servants were included in the study.

A multistage sampling technique was employed to select participants.

In the first stage, the thirty-two ministries within the Secretariat were treated as sampling clusters. Ten ministries were selected using simple random sampling by balloting without replacement.

In the second stage, employees from the selected ministries were stratified into four employment cadres according to their job classifications.

In the third stage, participants were selected proportionately from each cadre using stratified random sampling followed by simple random sampling. Every eligible civil servant within each stratum had an equal probability of selection for participation in the ophthalmic examination.

Eligibility Criteria

Inclusion Criteria

Participants were eligible for inclusion if they:

- were civil servants aged 35 years or older;
- had served in the civil service for at least two years;
- had no previous history of ocular trauma;
- had not undergone recent ocular surgery;
- provided written informed consent.

Exclusion Criteria

Participants were excluded if they:

- were younger than 35 years;
- had worked in the civil service for less than two years;
- had a history of ocular trauma;
- had undergone recent ocular surgery; or
- declined participation in the study.

Instruments for Data Collection

Data were collected using a structured interviewer-administered questionnaire, the Work Productivity and Activity Impairment Questionnaire: General Health Version 2.0 (WPAI-GH V2.0), and comprehensive ophthalmic examinations.

Structured Questionnaire

A structured interviewer-administered questionnaire developed by the researchers was used to obtain information from participants. The instrument consisted of two sections.

Section A collected socio-demographic information, including age, sex, educational level, occupational cadre, and years of service.

Section B obtained information on participants' ocular health history, previous eye conditions, medical history, and other relevant clinical characteristics.

Work Productivity and Activity Impairment Questionnaire (WPAI-GH Version 2.0)

Work productivity was assessed using the validated Work Productivity and Activity Impairment Questionnaire: General Health Version 2.0 (WPAI-GH V2.0). The instrument measures health-related impairment during the preceding seven days across four domains:

- absenteeism (work time missed because of health problems);
- presenteeism (reduced productivity while at work);
- overall work productivity loss;
- activity impairment outside work.

Scores were calculated according to the standardized WPAI scoring algorithm and expressed as percentages, with higher scores indicating greater impairment and lower work productivity.

Ophthalmic Examination

Comprehensive ophthalmic examinations were performed by licensed optometrists using standardized ophthalmic instruments, including: Hand-held visual acuity card; Snellen visual acuity chart; Pen torch; Direct ophthalmoscope; Calibrated tonometer; Schirmer strips.

Visual acuity was assessed using the Snellen chart at the standard testing distance. External ocular examination was performed using a pen torch, while fundus examination was conducted with a direct ophthalmoscope. Intraocular pressure was measured using a calibrated tonometer. Tear secretion was assessed using the Schirmer strip test to identify participants with dry eye disease.

Validity of the Instrument

The questionnaire was developed following an extensive review of relevant literature and was subjected to face and content validation by two senior consultant optometrists. The experts independently evaluated the instrument for clarity, relevance, comprehensiveness, and appropriateness in addressing the study objectives. Their recommendations were incorporated before the commencement of data collection.

Reliability of the Instrument

The reliability of the questionnaire was assessed through a pilot study involving 30 civil servants from the Abia State Secretariat, who possessed characteristics similar to those of the study population but were not included in the final study.

Internal consistency was determined using Cronbach's alpha reliability coefficient, which yielded a value of 0.78, indicating acceptable reliability of the instrument.

Data Collection Procedure

Data collection commenced after obtaining written informed consent from eligible participants. Trained research assistants administered the questionnaires through face-to-face interviews and assisted participants in clarifying questions where necessary.

Following questionnaire administration, each participant underwent a comprehensive ophthalmic examination conducted by a licensed optometrist. The examination included visual acuity assessment, external eye examination, ophthalmoscopy, measurement of intraocular pressure, and Schirmer strip testing for the diagnosis of dry eye disease. Standardized examination procedures were followed throughout the study to ensure consistency and minimize measurement bias.

Data Collection Procedure

Data collection commenced after obtaining written informed consent from eligible participants. Trained research assistants administered the questionnaires through face-to-face interviews and assisted participants in clarifying questions where necessary.

Following questionnaire administration, each participant underwent a comprehensive ophthalmic examination conducted by a licensed optometrist. The examination included visual acuity assessment, external eye examination, ophthalmoscopy, measurement of intraocular pressure, and Schirmer strip testing for the diagnosis of dry eye disease. Standardized examination procedures were followed throughout the study to ensure consistency and minimize measurement bias.

Statistical Analysis

Data were entered, cleaned, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 23.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics were summarized using frequencies, percentages, means, and standard deviations where appropriate.

Associations between ocular comorbidities and categorical productivity variables were assessed using the Chi-square test.

Differences in mean WPAI productivity loss scores among participants with glaucoma, cataract, dry eye disease, and ocular comorbidities were evaluated using one-way analysis of variance (ANOVA).

Multiple linear regression analysis was performed to determine the independent relationship between glaucoma comorbidity with cataract and dry eye disease and work productivity after adjusting for potential confounding variables.

All statistical tests were two-tailed, and statistical significance was established at $p < 0.05$.

Ethical Considerations

Ethical approval for the study was obtained from the Ethics Committee of the Department of Public Health, Imo State University, and administrative approval was obtained from the ministry of Health of the Imo State Secretariat before commencement of the study

Participation was entirely voluntary. Written informed consent was obtained from all participants after explaining the purpose, procedures, potential benefits, and minimal risks associated with the study. Participants were informed of their right to withdraw from the study at any stage without any consequences.

Confidentiality and anonymity were maintained by assigning unique identification numbers to participants, and all information obtained during the study was treated with strict confidentiality and used solely for research purposes. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki governing research involving human participants.

Results

Table 1: Relationship between glaucoma and productivity

Source	Sum of Squares	Df	Mean Square	F	p-value
Glaucoma	727	1	727	0.848	0.358

From table 1 above, the result of the ANOVA Test shows that the relationship between glaucoma and productivity is not statistically significant

Table 2: Relationship between cataract and productivity

Source	Sum of Squares	Df	Mean Square	F	p-value
Cataract	252,843	1	252,843	295.219	<.001

Result from table 2 above, shows that cataract has a strong statistically significant relationship with productivity.

Table 3: Relationship between dry eye and productivity

Source	Sum of Squares	Df	Mean Square	F	p-value
Dry Eye	612,489	1	612,489	715.142	<.001

Result from table 3 above shows that dry eye has a strong statistically significant relationship with productivity

Table 4: Relationship between glaucoma comorbidity with cataract and dry eye and productivity

Source	Sum of Squares	Df	Mean Square	F	p-value
Comorbidities	14,886	1	14,886	17.381	<.001
Glaucoma	727	1	727	0.848	0.358
Cataract	252,843	1	252,843	295.219	<.001
Dry Eye	612,489	1	612,489	715.142	<.001

A correlation analysis was conducted to examine the relationship between comorbidity burden (measured as the sum of glaucoma, cataract, and dry eye) and overall productivity among civil servants. There is a weak positive linear relationship: Higher productivity loss tends to be slightly associated with the presence of comorbidities. The correlation is statistically significant ($p = 0.000419$), but the strength is low ($r \approx 0.1$

There was a statistically significant but weak positive relationship between comorbidity burden and productivity loss ($r \approx 0.18$, $p < 0.001$), indicating that as eye conditions increase, productivity loss tends to increase slightly.

Discussion

The study examined the association of glaucoma co-morbidity with cataract and dry eye illness to job productivity among civil officials working in the Imo State Secretariat, Owerri, Nigeria. The results demonstrated that glaucoma was not statistically significantly associated with work productivity independently after adjustment for coexisting visual diseases. Dry eye illness was the strongest independent connection with productivity loss, followed by cataract [10]. Furthermore, a statistically significant, but modest, positive association was found between ocular comorbidity burden and productivity loss, showing that increasing numbers of coexisting ocular disorders were related to gradual decreases in work performance[11].

The high link between dry eye illness and productivity loss is consistent with a growing body of data suggesting dry eye disease is one of the most significant ocular disorders impacting occupational performance. Research indicates that individuals with dry eye disease suffer large productivity losses, mostly from presenteeism rather than absenteeism, as workers with dry eye disease tend to remain at work despite ocular discomfort, fluctuating vision, irritation and visual fatigue [12]. The estimated production losses due to dry eye illness vary from around 18 to 30 percent, and even higher losses for those with moderate to severe symptoms. The considerable productivity loss associated with dry eye illness in this study is physiologically and occupationally feasible because civil servants often engage in lengthy computer use, document examination and other visually demanding administrative tasks[14]. Prolonged periods of screen exposure with reduced blink rates and air-conditioned working environments might increase tear film instability and ocular surface inflammation, which can affect concentration, reading efficiency and overall work performance[15]. Cataract was also significantly associated with impaired productivity at work. This finding is in agreement with earlier research that show that visual impairment due to cataracts severely affects occupational functioning, mobility, reading ability and activities of daily living, while cataract surgery significantly improves productivity, economic independence and quality of life [16]. In contrast to intervention studies that largely focus on productivity after cataract surgery, this study offers evidence of the productivity cost borne by an economically active working population before treatment. The progressive loss in visual acuity, reduced contrast sensitivity and increased glare sensitivity associated with cataract are potential contributors for reduced job efficiency notably in occupations requiring sustained visual attention and computer related tasks[17].

Reduced productivity was not independently linked with glaucoma after accounting for other ocular diseases, although this finding should be regarded with caution. Previous studies have revealed an association between glaucoma and increased absenteeism, lower labour force participation, reduced performance at work and an economic burden, especially for people with severe disease or significant visual field loss [18] Several factors may have contributed to the lack of an independent correlation in this study. First, a large proportion of people with glaucoma may be in the early stages of the disease, in which central visual acuity is typically intact despite gradual peripheral visual field loss. Second, adjustment for coexisting cataract and dry eye illness may have underestimated the independent effect of glaucoma on productivity loss. Finally, the binary classification of glaucoma utilised in this study may not have taken into account disease severity, duration, adherence to treatment, or degree of visual field loss, all of which are key drivers of functional disability and occupational performance[19].

One of the main findings of this study was the modest positive correlation between the burden of ocular comorbidity and productivity loss that was statistically significant ($r \approx 0.18$, $p < 0.001$). Our findings imply that job productivity decreases with the increasing number of coexisting ocular diseases, albeit the magnitude was moderate. The comparatively modest

correlation coefficient implies that ocular comorbidity is only one of numerous predictors of productivity at the job. Other factors such as age, educational qualification, occupational demands, psychosocial stress, systemic illnesses, workplace ergonomics, job satisfaction and organisational support may also affect employee performance. However, the statistically significant link underlines the cumulative effect of many ocular illnesses on functional capacity and supports the necessity for comprehensive eye health assessments rather than disease-specific screening programmes[20]. These results are of major importance to occupational and public health. Civil servants are employees involved in work that requires constant visual capability for reading, computer operation, data processing, and making administrative judgements. Undiagnosed or poorly controlled ocular illnesses lead to diminished efficiency, increased presenteeism and, eventually, diminished institutional productivity. The opportunity to detect glaucoma, cataract and dry eye disease before development of significant visual impairment could be provided by comprehensive ocular screening within the occupational health programmes. Interventions in the workplace such as ergonomic changes, optimisation of computer workstation design, regular visual breaks, proper lighting, and eye health education may further reduce visual tiredness and preserve productivity of employees[21].

However, despite its strengths, this study has many limitations. Causal inference between ocular comorbidity and productivity loss is limited due to the cross-sectional methodology. The participants were drawn from a single government secretariat, which would limit the generalisability of the findings to different occupational settings in Nigeria. In addition, characteristics that could have altered the association with productivity were not assessed, such as severity of glaucoma, visual field status, length of disease, and treatment adherence. Future multicentre longitudinal studies using objective measurements of visual function and disease severity are recommended to better characterise the long-term occupational effects of ocular multimorbidity.

Conclusion

This study found that dry eye illness and cataract were major contributors to decreased work productivity among the government officials in the Imo State Secretariat. The presence of glaucoma alone was not an independent predictor of productivity loss after adjusting for coexisting ocular diseases. However, the combined burden of glaucoma, cataract and dry eye disease was strongly associated with greater productivity loss. This highlights the importance of ocular multimorbidity rather than individual eye disorders in occupational health assessments. These findings highlight the necessity for comprehensive eye health treatments to be integrated in occupational health programmes for civil officials. Routine ophthalmic screening, periodic visual health assessments, workplace ergonomic interventions and eye health education should be incorporated into pre-employment and periodic medical examinations to assist early diagnosis, timely management and avoidance of avoidable visual impairment. Such solutions have the potential to increase employee wellbeing, improve productivity in the workplace and minimise the socioeconomic burden associated with chronic ocular disorders.

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