Prevalence and causes of visual impairment among inmates of prison in Tanzania

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ABSTRACT

Background: Ocular disorders are among the causes of morbidity necessitating frequent attendance for medical care worldwide. Prisoners, like any other person, are prone to suffer from any ocular disorder and sometimes are at increased risk of morbidity and visual impairment due to challenges related to access to health care in a prison environment. According to the World Health Organization report on vision, about 2.2 billion people have visual impairment and blindness. The commonest cause of visual impairment among them is uncorrected refractive errors.

Objective: To determine the prevalence and causes of visual impairment among inmates of Isanga prison in Dodoma city, Tanzania.

Methodology: An analytical cross-sectional study employed systematic sampling technique to recruit 274 inmates of Isanga prison in Dodoma city. Data was analyzed by Statistical Package for Social Sciences version 23 (SPSS 23). Ethical approval was granted by Muhimbili University of Health and Allied Sciences Institutional Review Board. Permission to conduct the study was obtained from the Commissioner General of Isanga Prison.

Results: Out of 274 study participants, 85% of them were males with a median age of 45 years. Visual impairment was found in 8% of participants, where 71% had moderate visual impairment. Optic neuropathy was the leading cause (52%) of visual impairment followed by glaucoma and cataract 19% each. Increasing age was the only factor associated with visual impairment in univariate, but not in multivariate analysis.

Conclusion: There was a significant proportion of inmates with visual impairment and the leading causes of visual impairment were optic neuropathy and glaucoma.

Key words: Prevalence, Causes, Visual impairment, Inmates, Prison, Tanzania

INTRODUCTION

Worldwide at least 2.2 billion people have vision impairment and blindness out of which 1 billion could be prevented if detected early, while that of inmates of prison ranges from 1.35% to 11.3% [1-4]. Globally, it has been estimated that everyone will acquire at least one ocular disorder in their lifetime which will require appropriate care, prisoners as any other person are prone to suffer from any ocular disorder and sometimes are at increased risk due to challenges associated with imprisonment[1-3,5].

Imprisonment is associated with several consequences like loss of sense of personhood, self-inflictions, brutalization by other inmates or by guards that can cause several injuries including ocular injuries which can contribute to occurrence of ocular disorders. Prisoners are usually overcrowded which is associated with many health-related problems like spread of infectious disease, delayed health care seeking, lack of individualized treatment which may lead to poor treatment outcomes[6].

Ocular disorders can cause vision impairment which affects quality of life, for example in diseases like cataract, uncorrected refractive error, glaucoma, macular degeneration, corneal opacity, and retinopathy. Occasionally, it causes mortality in the presence of ocular malignant tumors. However, some of these disorders are reversible like in cataract and uncorrected refractive errors if appropriate care is taken but for disorders like glaucoma, macular degeneration and retinopathy are irreversible although if detected and managed early may halt its progression[7-9].

Poor eye health services in prison health facilities are likely to contribute to late detection of asymptomatic ocular disorders and poor treatment outcomes, therefore this study aimed at assessing the proportion and causes of visual impairment among inmates of Isanga prison so as the findings will help policy makers in planning for incorporating eye health services in their health protocol to improve eye care in prison.

Aim of the study: To determine the prevalence and causes of visual impairment among inmates of Isanga prison in Dodoma city, Tanzania.

Research question: What is the prevalence and causes of visual impairment among inmates of Isanga prison in Dodoma city, Tanzania?

MATERIALS AND METHODS

Study design: This was a community based analytical cross-sectional study conducted in September 2021 among adult inmates of prison aged 18 years and above at Isanga prison in Dodoma.

Sample size calculation: The sample size was obtained by the Kish and Leslie and adjusted or corrected for a finite population of Isanga prison which were 1338 inmates.
Formula n= (Nz^2 p(1-p))/ (d^2 (N-1) +Z^2 P(1-P))
Whereby
n = Sample size with finite population correction
N = Size of the population which is 1338
z = 1.96 95% confidence level which is equal to 1.96
p = Proportional of ocular disorders among prisoners found at Ilesa prison in Nigeria = 69.7%
d = Marginal error which is taken to be 3%
Calculated sample size (n) = 262

Sampling technique: Systematic sampling technique was applied to reduce bias and a total of 274-sample size reached.

Inclusion and exclusion criteria: All inmates of Isanga prison aged ≥18 years and willing to participate in the study were included. Extremely weak inmates who were unable to withstand ocular examination and those who had difficulties in communication were excluded.

Variables: Visual impairment as a dependent, was statistically organized as binary variable, with codes of '0' and '1' for absence and presence of the condition, respectively. We studied several independent variables like age, sex, duration in the prison, history of alcohol use, history of drug abuse, history of diabetes and history of hypertension.

Data collection tools: We used a semi structured questionnaire to collect data, literate and illiterate Snellen charts to assess visual acuity. A pinhole test for those with visual acuity of less than 6/18 aided to identify those requiring refraction. Icare tonometer was used to measure intraocular pressure. Blood pressure and weighing machines were used to measure blood pressure and body weight. A glucometer was used to test blood sugar in those suspected to have diabetes mellitus from fundoscopic changes. Examination of the anterior segment was done by a torch and a slit lamp (Haag Streit). The posterior segment was examined by using an indirect ophthalmoscope with 20 and slit lamp biomicroscope with 90D. Refraction was done by retinoscope and trial lenses. Near vision was tested by Jaeger eye chart with M notation at 33cm from the eye.

Data collection procedures: Data collection started with a short history of the participants on demographic characteristics, history of chronic illness like hypertension and diabetes, history of trauma and duration of stay in the prison. Then, visual acuity was assessed using Snellen literate and illiterate E charts and categorized as normal (6/6 - 6/18), moderate visual impairment (<6/18 – 6/60), severe VI (<6/60 – 3/60), and blindness (<6/60 – NPL). The intraocular pressure (IOP) was taken using Icare tonometer and was categorized as normal (10-21mmHg), high (>21mmHg) and low (<10mmHg). Blood pressure and body mass index were checked and recorded for risk factors assessment.

Slit lamp examination was done using Haag Streit slit lamp and a pen torch to assess the abnormalities in the anterior segment such as chalazion, pterygium, corneal opacities, uveitis, and cataract. Assessment of refractive status was done by an optometrist using a retinoscope and trial lenses. Fundus examination for any abnormalities on the vitreous, optic disc and the retina was done using either an overhead indirect ophthalmoscopy or slit lamp with 90D lens. All these examinations were done under the supervision of an experienced ophthalmologist.

Uncomplicated disorders like conjunctivitis were managed on the ground with eye drops. Inmates with the diagnosis of presbyopia were offered reading spectacles but inmates requiring further medical or surgical treatment like chalazion excision, pterygium excision and cataract surgery were referred to Benjamin Mkapa Hospital. All data were recorded in the structured questionnaire.

Data analysis: Data analysis was done by using Statistical Package for The Social Sciences (SPSS) version 23. Descriptive and analytical analysis was done. where odds ratios, 95% confidence intervals, and P-values computed to assess any predictive effect of the demographic characteristics and visual impairment. The P-value of <0.05 was considered statistically significant.

Ethical consideration: Ethical clearance to conduct the study was obtained from the institutional review board of MUHAS. Permission to conduct the study was given by the commissioner general of Isanga prison. Participants were informed comprehensively about the purposes and benefits of the study.

All participants signed an informed consent before recruitment into the study. Serial numbers instead of names of participants were used on the questionnaire and consent forms. Every questionnaire was attached by one copy of informed consent. Those who refused to participate in the study were managed without filling the study questionnaire.

RESULTS

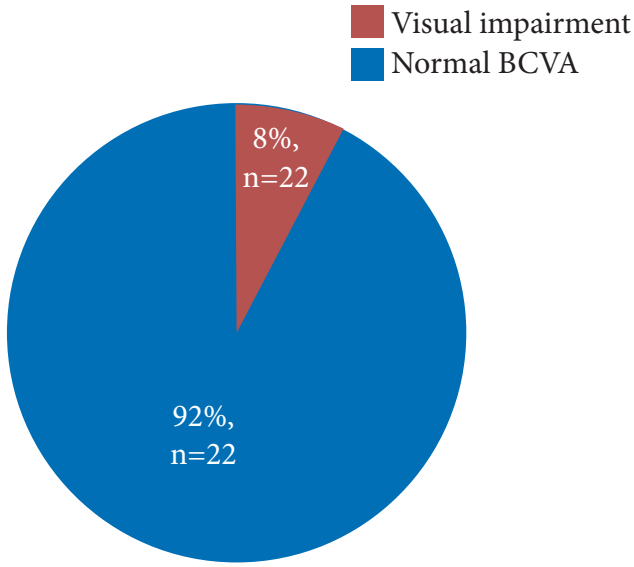
A total of 274 participants were studied and majority of them were males (85%) with a median age of 45 years and most of them (52%) have been in prison for less than 5 years (Table 1).

Table 1: Socio-demographic characteristics of study participants (n = 274)

Characteristic	Frequency	
	No.	(%)
Age group (years)		
18 – 37	96	35.00
38 – 57	129	47.10
>57	49	17.90
Median age in years (Range) 45, (18, 83)		
Sex		
Male	233	52.60
Female	41	47.40
Median duration of stay in prison in years (Range) 4 (1, 46)		

About (8%) of the study participants had visual impairment (Figure 1).

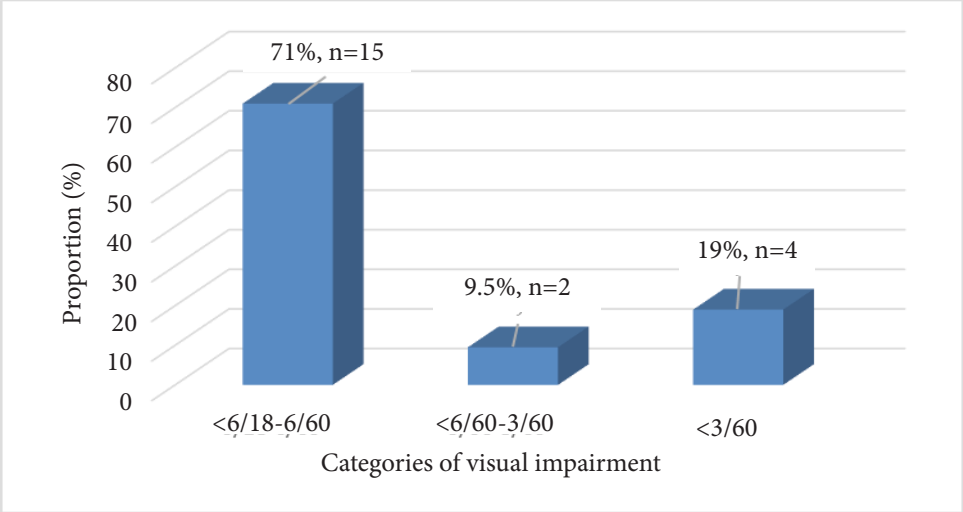
Figure 1: Proportion of visual impairment among study participants, (n=274)



BCVA – Best corrected visual activity

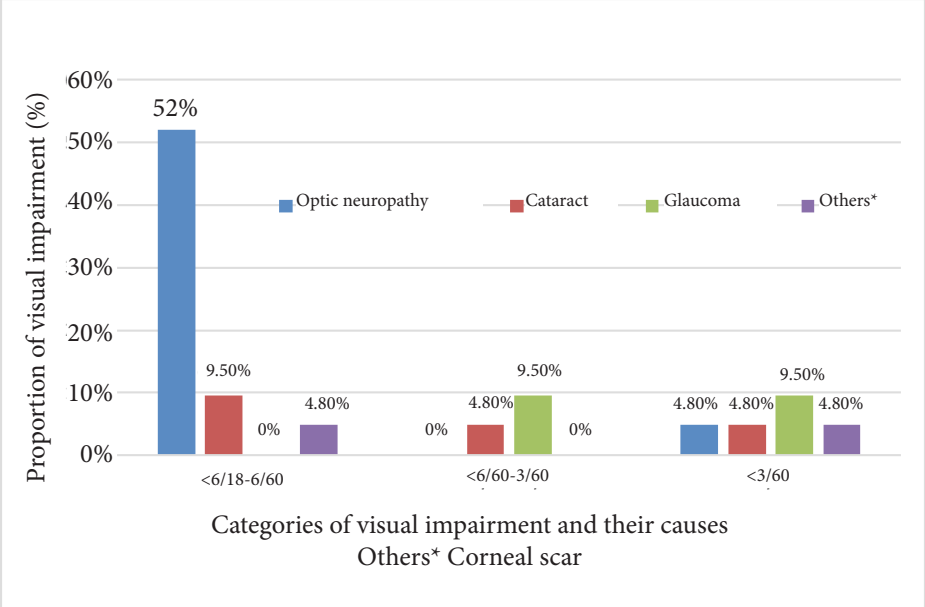
Majority of the participants (71%) with visual impairment had moderate visual impairment (<6/18-6/60) (Figure 2).

Figure 2: Categories of visual impairment among study participants, (n=22)



Most of the study participants with visual impairment (52%) were due to optic neuropathy and had moderate visual impairment (Figure 3).

Figure 3: Causes of visual impairment among study participants by categories of visual impairment (n=22)



DISCUSSION

The proportion of visual impairment among inmates of prison was 8.0% after best correction; those with visual impairment due to refractive error were given spectacle prescription. The proportion of visual impairment was slightly lower than that reported among inmates of one prison in the United States of America where the prevalence was 11.3%[4]. The difference could be because in this study we examined participants and came up with the diagnosis, this avoided over estimation of visual impairment. On the contrary, this proportion is higher than a study from Nigeria by Alexander[3] where visual impairment among inmates of prison was 4.7%, this can be explained partly by the differences in the distribution of study participants where in this study were slightly older than the study from Nigeria.

The identified causes of visual impairment were optic neuropathy, glaucoma, cataract, and corneal scar in that order. Optic neuropathy could be due to insufficient nutrients in the diet they get as it has been documented that inmates of prisons are at high risk of developing micronutrients deficiencies like vitamin A, vitamin B and D[10], on the other side could be due to trauma as has been reported in several publications but also in this study there was a considerable number of trauma before and after imprisonment[4] however its association need to be studied. Glaucoma in this study was found in 2.6% of study participants and ocular hypertension in about 2.2%. The less contribution of cataract in the causes of visual impairment could be explained by two reasons, one is due to demographic distribution of study participants as most of them (more than 82.1%) were less than 60 years old as it has been document that the prevalence of cataract

increases with age, also several programs attend the prison for cataract screening and those indicated for surgery are scheduled to attend base hospitals for the same.

The two conditions require management with ant glaucoma medication. Four patients were already on medication while nine were diagnosed and started on medication. Untreated glaucoma has the potential to cause irreversible blindness, therefore early detection and initiation of appropriate management cannot be overemphasized. Mechanisms to monitor these patients must be set up to ensure they continue with follow up for glaucoma, ocular hypertension, and optic neuropathy.

Limitation

Some investigations like blood tests, perimetry and Optical Coherent Tomography (OCT) were not done, this may over or underestimates some conditions, however clinical findings from history and examination aided to reach the diagnosis.

Participants who had optic neuropathy were not given treatment during the study period, however participants were advised on use of a balanced diet as much as possible but also to attend nearby hospitals for definitive diagnosis and treatment.

Conclusion

There is a considerable proportion of visual impairment among inmates of Isanga prison. The causes of visual impairment among inmates of Isanga prison were optic neuropathy, glaucoma, and cataract.

Recommendations

Establishment of a link between Isanga prison and regional hospital for extension of eye services and ensure constant availability of medication for diseases like glaucoma at prison dispensary. Further studies are needed to identify causes of optic neuropathy among inmates of prison.

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Availability of data and materials: The data are available from the corresponding author upon reasonable request.

Competing interests: The authors declared no conflicts of interest. However, it has been presented in Morogoro during the annual meeting of Tanzania Ophthalmology Society (TOS) in June 2022 and in Lilongwe during the COECSA annual congress in September 2022.

REFERENCES

1. Ekwenchi EE, Ezegwui I, Ezepue U, *et al.* Pattern of eye disorders among inmates of a Nigerian Prison. *Orient J Med*. [Internet] 2010; **21**: 1-4.
2. Ajite KO, Adegbehingbe BO, Omotoye OJ, *et al.* Prevalence of eye disease among inmates of Ilesa Prison, Southwest Nigeria. *Afr J Online*. 2011; **4** (1): 2.
3. Alexander OA. Frequency and pattern of eye diseases among prisoners in Benin City at Oko prison. *NPMCN*. [Internet] 2019 [cited 2021 Jan 08]; (2005). https://dissertation.npmcn.edu.ng/index.php/FMCPH/article/view/2402
4. Department of justice, USA. Medical problems of prisoners: *Bureau of Justice Statistics. [Internet]* 2008 [cited 2020 Oct 15]; https://www.bjs.gov/content/pub/pdf/mpp.pdf
5. Maria CSM, Adalgisa PR. Health conditions of prisoners in the state of Rio de Janeiro, Brazil. *Ciência Saúde Coletiva*. 2016; **21**(7):2031- 40.
6. Jaba TS. Prisons and imprisonment: 2019. MKUNDI LEGAL SERVICE BLOG [Internet] Dar- Es- Salaam, Tanzania [cited 2021 Jan 31]. https://mkundilegalservice.blogspot.com/2019/02/prisons-and-imprisonment-in-tanzania.html
7. World Health Organisation. Visual impairment and blindness: [Internet]. 2020 [cited 2020 Oct 20]. https://www.who.int/news-room/fact-sheets/detail/blindness-and-visual-impairment
8. World Health Organisation. World report on vision: [Internet] 2019 [cited 2020 Oct 18]. https://www.who.int/publications/i/item/world-report-on-vision
9. Mafwiri M, Mwakyusa N, Shilio B, *et al*. Situational analysis of infrastructure and human resources for diabetic retinopathy services in Tanzania. *J Ophthalmol East Cent South Afr*. 2014; **18**(2): 49-58.
10. Gould, C., Tousignant, B., Brian, G. *et al.* Cross-sectional dietary deficiencies among a prison population in Papua New Guinea. *BMC Int Health Hum Rights*. 2014; **13:** 21. https://doi.org/10.1186/1472-698X-13-21