

Evaluation of Newborn Screening Practices and Interventions for Ocular Disorders Among Under-Five Children at Mzuzu Central Hospital, Malawi

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Abstract:

This study investigates newborn ocular screening practices and intervention strategies for under-five children at Mzuzu Central Hospital, Malawi. A retrospective cross-sectional design was used, analyzing data from 400 children treated between 2019 and 2021. Findings revealed that 49.6% of the ocular disorders were serious and sight-threatening, with the highest prevalence among children aged 0–1 year. Time of intervention showed a stronger correlation with outcomes than type of intervention. Early screening and intervention significantly improved visual prognosis. The study highlights the need for institutionalized screening protocols to prevent avoidable visual impairments in early childhood.

Keywords: Newborn screening, ocular disorders, under-five children, Malawi, intervention outcomes, early diagnosis.

المخلص

تحقق هذه الدراسة من ممارسات الفحص العيني للأطفال حديثي الولادة واستراتيجيات التدخل للأطفال دون سن الخامسة في المستشفى المركزي. تم استخدام تصميم مقطعي استعادي، حيث تم تحليل بيانات من 400 طفل تمت معالجتهم بين عامي 2019 و 2021. كشفت النتائج أن 49.6% من الاضطرابات العينية كانت خطيرة وتهدد البصر، مع أعلى معدل انتشار بين الأطفال الذين تتراوح أعمارهم بين 0–1 سنة. أظهر وقت التدخل ارتباطاً أقوى مع النتائج مقارنة بنوع التدخل. أدى الفحص المبكر والتدخل إلى تحسين كبير في التنبؤ بالبصر. تسلط الدراسة الضوء على الحاجة إلى بروتوكولات فحص مؤسسية لمنع ضعف البصر القابل للتجنب في مرحلة الطفولة المبكرة.

الكلمات المفتاحية: فحص حديثي الولادة، الاضطرابات العينية، الأطفال دون سن الخامسة، مالاوي، نتائج التدخل، التشخيص المبكر.

INTRODUCTION

Vision plays a central role in a child's development, influencing learning, communication, and overall quality of life. Early childhood, especially the first five years, is a critical period for visual system maturation. Undetected ocular conditions during this period can lead to irreversible visual impairment, developmental delays, and social disadvantages. Globally, the World Health Organization (WHO) estimates that 1.4 million children are blind, with the majority residing in low-income countries where access to preventive screening is limited. In many developed nations, newborn screening programs include ocular evaluations as part of routine postnatal care. These initiatives have proven effective in detecting congenital cataract, glaucoma, retinoblastoma, and retinopathy of prematurity (ROP) at stages where intervention can preserve or restore vision. In contrast, many low-resource settings, including Malawi,

lack structured protocols for early eye screening, leading to late diagnoses and preventable childhood blindness.

According to the 2018 Malawi National Statistical Office report, visual impairment is the second most common childhood disability, following hearing loss. Despite the availability of specialized eye care services at Mzuzu Central Hospital, there is no formal mechanism to screen newborns or monitor ocular health during routine child visits. Most children with visual impairments are only diagnosed after symptoms become advanced or when complications such as amblyopia have already developed. This study evaluates newborn screening practices and intervention strategies for ocular disorders among children under the age of five at Mzuzu Central Hospital. By identifying the prevalence and patterns of eye conditions and analyzing treatment outcomes, the study aims to highlight the need for policy reforms and targeted investments in pediatric vision screening.

METHODOLOGY

Study Design

This research employed a retrospective cross-sectional design, suitable for evaluating existing clinical records to identify trends and associations in healthcare delivery. The design enabled the researchers to examine the prevalence of ocular conditions and assess the impact of intervention timing and type on treatment outcomes among children under the age of five.

Study Setting

The study was conducted at Mzuzu Central Hospital, a tertiary-level public health facility located in the northern region of Malawi. The hospital serves as a referral center for six district hospitals and over 40 primary health facilities. It houses a well-established Eye Department equipped with modern ophthalmic devices and staffed by ophthalmologists, optometrists, and ophthalmic clinical officers. Despite its capabilities, the facility lacks a formal pediatric vision screening program at birth or during routine child health visits.

Population and Sampling

The study population comprised children aged 0 to 5 years who were treated at the Mzuzu Central Hospital Eye Department between January 2019 and December 2021. A total of 400 clinical cases were included. Inclusion criteria were: (1) children aged 0–5 years at the time of diagnosis, (2) diagnosis of any ocular disorder, and (3) availability of complete medical records including treatment and follow-up. Cases with incomplete records or non-ocular diagnoses were excluded. A purposive sampling approach was applied due to the specific nature of the investigation.

Data Sources and Collection

Data were extracted from hospital registers and the digital health information management system. Trained health record personnel and the research team abstracted relevant variables using a standardized data collection tool. The following variables were recorded: patient age, gender, type of ocular disorder, place of diagnosis, type and timing of intervention, and clinical outcomes post-intervention.

Variables and Operational Definitions

- i. Independent variables: age at diagnosis, type of disorder, time of intervention, and type of intervention (e.g., outpatient treatment, surgical management, referral, co-management).
- ii. Dependent variable: outcome after treatment, categorized as desirable (functional vision retained) or undesirable (vision loss, amblyopia, enucleation, or other complications).
- iii. Early intervention: defined as treatment administered before the age of one year.
- iv. Late intervention: treatment initiated after the first year of life.

Data Analysis

Data were coded and analyzed using SPSS version 20. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize patient demographics and disorder distribution. Associations between variables were tested using Chi-square analysis. The strength of correlation between timing/type of intervention and outcomes was evaluated using Pearson's correlation coefficient. Linear regression analysis was used to determine predictive relationships. A p-value of <0.05 was considered statistically significant, and 95% confidence intervals were reported.

Ethical Considerations

The study was approved by the Research Directorate of Mzuzu Central Hospital. As secondary data were used, patient confidentiality was strictly maintained by anonymizing records and using de-identified datasets. The research posed minimal risk to participants and complied with the ethical standards of UNICAF University and the Malawi Ministry of Health. The study was approved by the Research Directorate of Mzuzu Central Hospital. As secondary data were used, patient confidentiality was strictly maintained by anonymizing records and using de-identified datasets. The research posed minimal risk to participants and complied with the ethical standards of UNICAF University and the Malawi Ministry of Health.

RESULTS

Demographics

A total of 400 children under the age of five were evaluated, with a nearly equal gender distribution (199 males and 201 females). The mean age was 2.29 years (± 1.6 SD), with the majority of cases (49.5%) occurring in the 0–1 year age group.

Distribution of Ocular Disorders

The most frequently diagnosed ocular disorder was Ophthalmia Neonatorum (22.5%), followed by Congenital Cataract (14.5%) and Congenital Glaucoma (12%). A smaller proportion of cases involved life-threatening or visually disabling conditions such as Retinoblastoma (4%) and Retinopathy of Prematurity (4.8%). The full distribution is illustrated in Figure 1.

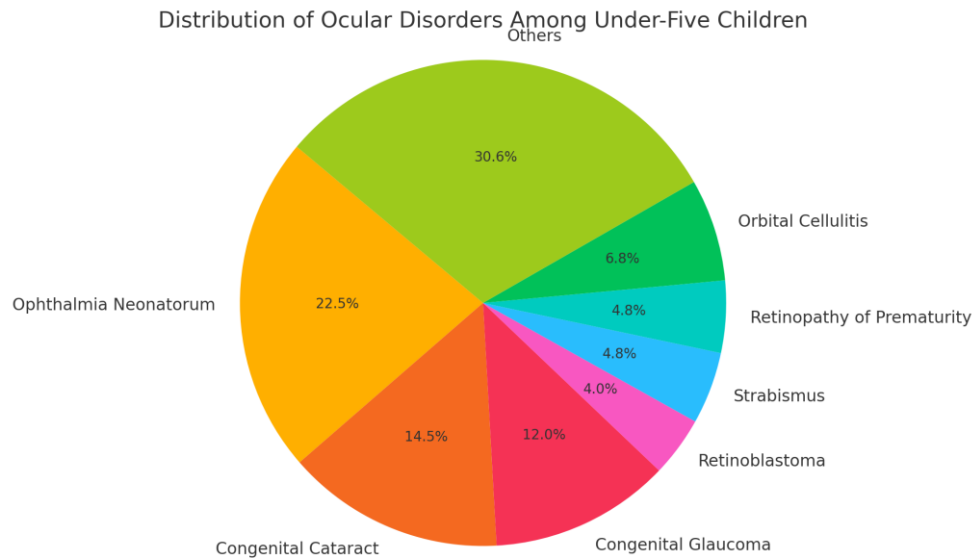


Figure 1. Distribution of Ocular Disorders Among Under-Five Children

Interventions and Outcomes

Among the 400 cases, 198 children received treatment in the outpatient eye clinic, 31 were admitted for surgical procedures, 133 were referred to higher-level facilities, and 38 were co-managed with other medical practitioners. The breakdown of intervention types is shown in Figure 2.

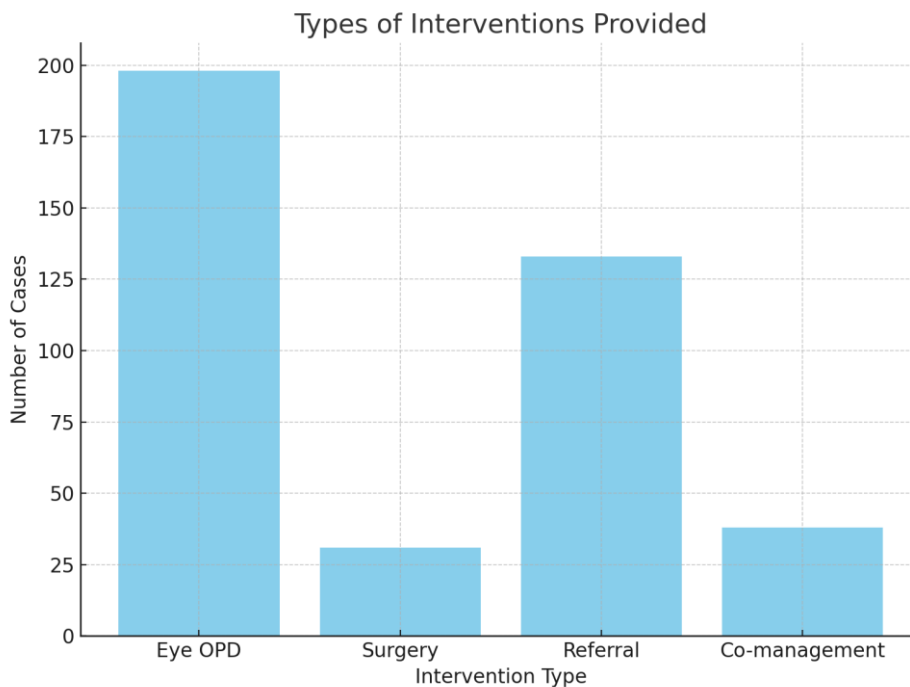


Figure 2. Types of Interventions Provided to Children with Ocular Disorders

Conclusion

This study highlights critical gaps in the early detection and management of ocular disorders among children under five years old in Malawi. The findings reveal a concerning prevalence of serious and potentially preventable eye conditions,

particularly among infants within their first year of life. A substantial proportion of these disorders—such as congenital cataract, glaucoma, and retinoblastoma—were either diagnosed late or managed suboptimally due to the absence of structured screening protocols and resource constraints.

Importantly, the study demonstrates that early intervention significantly improves visual prognosis. Children who received treatment within the first year of life were more likely to retain functional vision, while those treated later exhibited a higher incidence of amblyopia and irreversible visual impairment. Time of intervention emerged as a stronger predictor of treatment outcome than the type of intervention, emphasizing the urgent need for timely diagnosis.

These findings underscore the necessity of integrating routine ocular screening into neonatal and under-five child health services across Malawi. Standardized protocols, trained personnel, and affordable diagnostic tools should be prioritized within maternal and child health programs. Moreover, capacity building at district-level hospitals, combined with referral mechanisms to tertiary centers, will help bridge the gap in specialist pediatric ophthalmic care.

In light of these insights, the study advocates for national policy reforms that mandate universal newborn eye screening as part of essential newborn care. Collaborative efforts between government health authorities, international donors, and professional bodies are needed to establish sustainable infrastructure and ensure that no child suffers preventable vision loss due to delays in detection and treatment.

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